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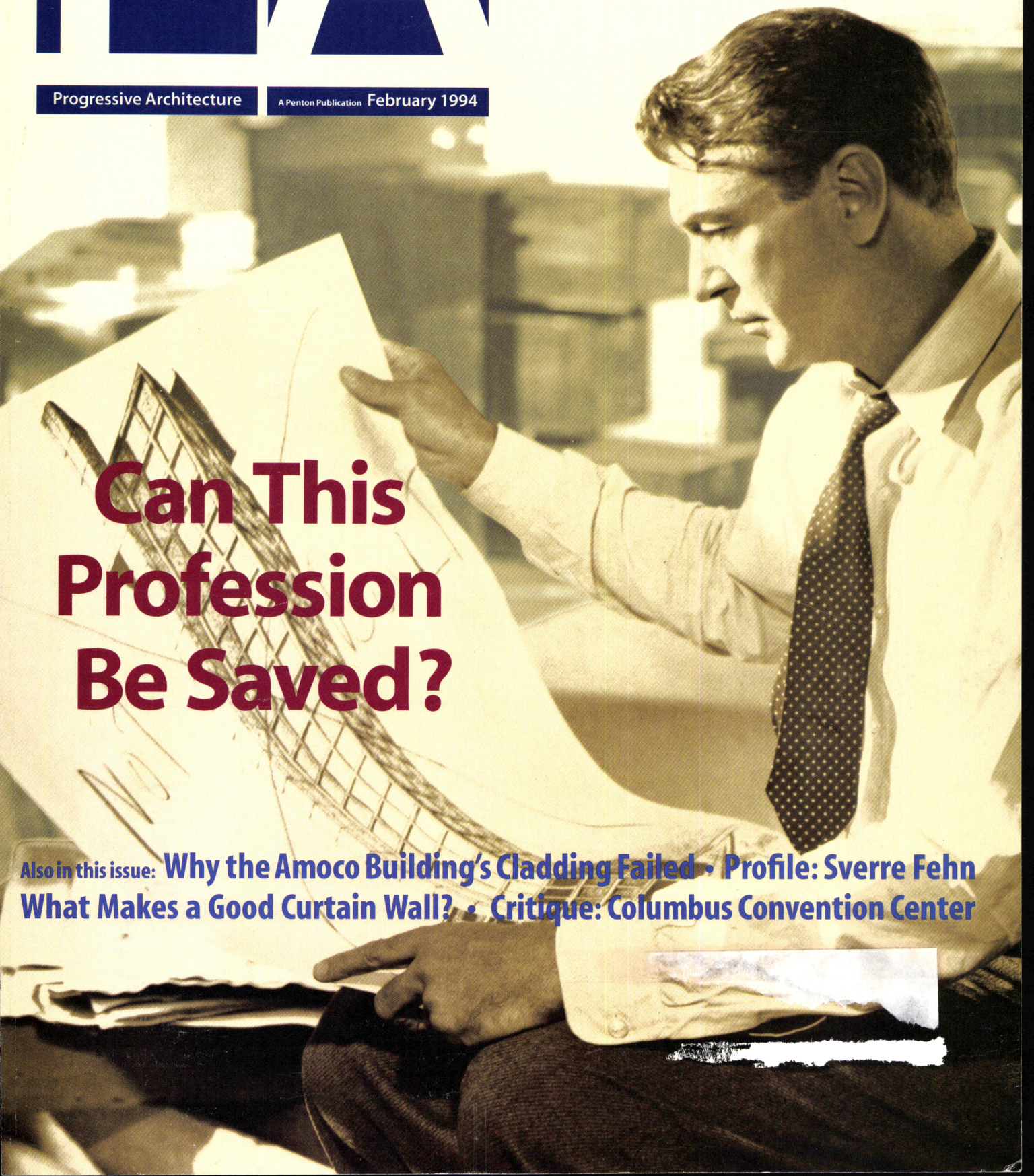
Progressive Architecture | A Penton Publication February 1994



Can This Profession Be Saved?

Also in this issue: Why the Amoco Building's Cladding Failed • Profile: Sverre Fehn
What Makes a Good Curtain Wall? • Critique: Columbus Convention Center

IT'S HARD ENOUGH TO GET ONE ROOM AT THIS HISTORIC HOTEL. IMAGINE WHAT IT

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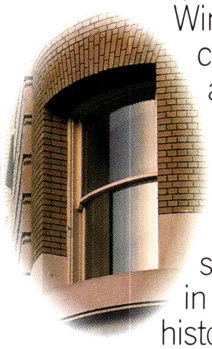

No less of a challenge were the hotel's 585 aging double-hungs. Each demanded the same craftsmanship and attention to detail in order to maintain sightlines and replicate the historical profiles of the originals. And to guarantee their durability and consistency, each would have to incorporate the same performance features, too.

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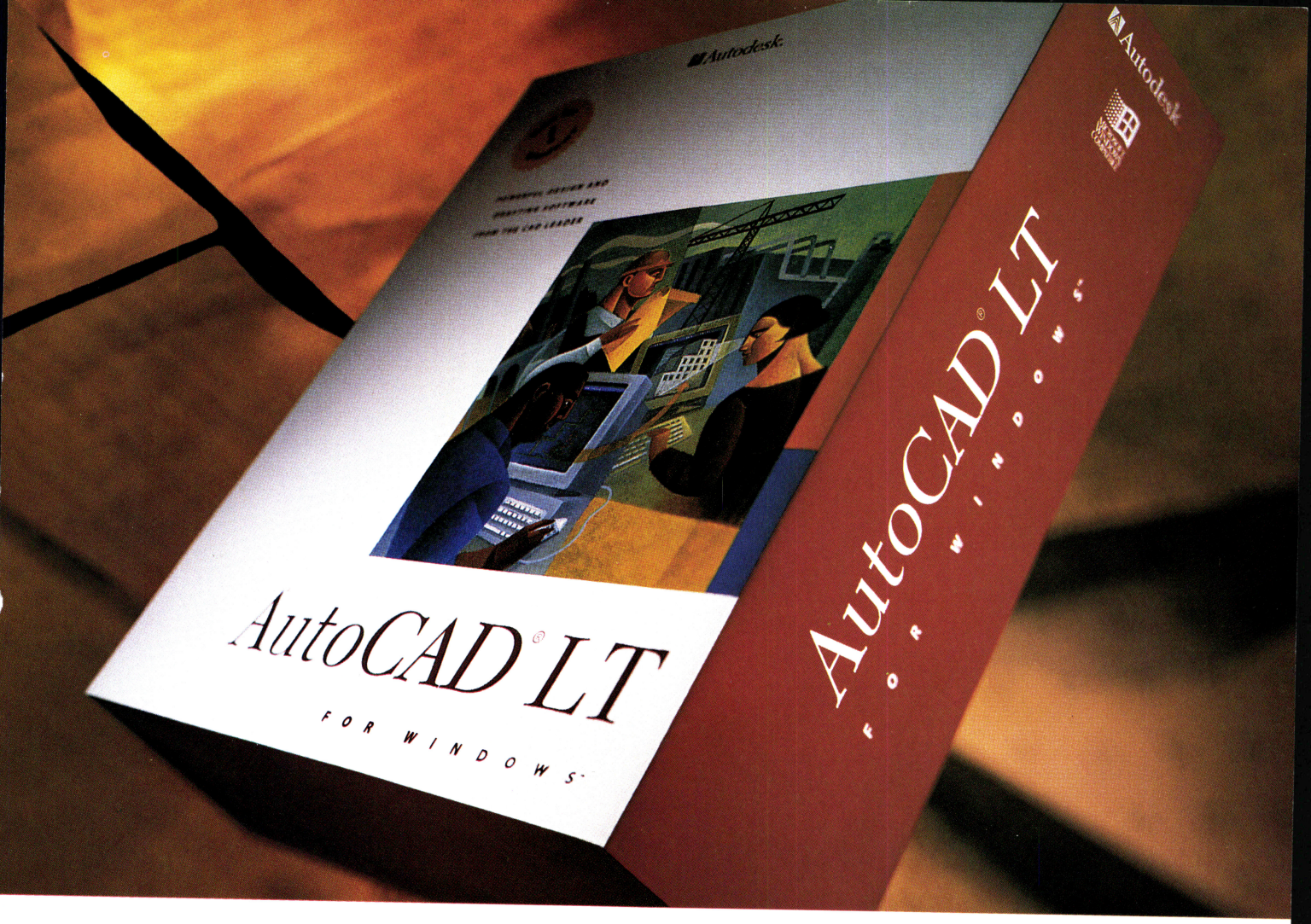

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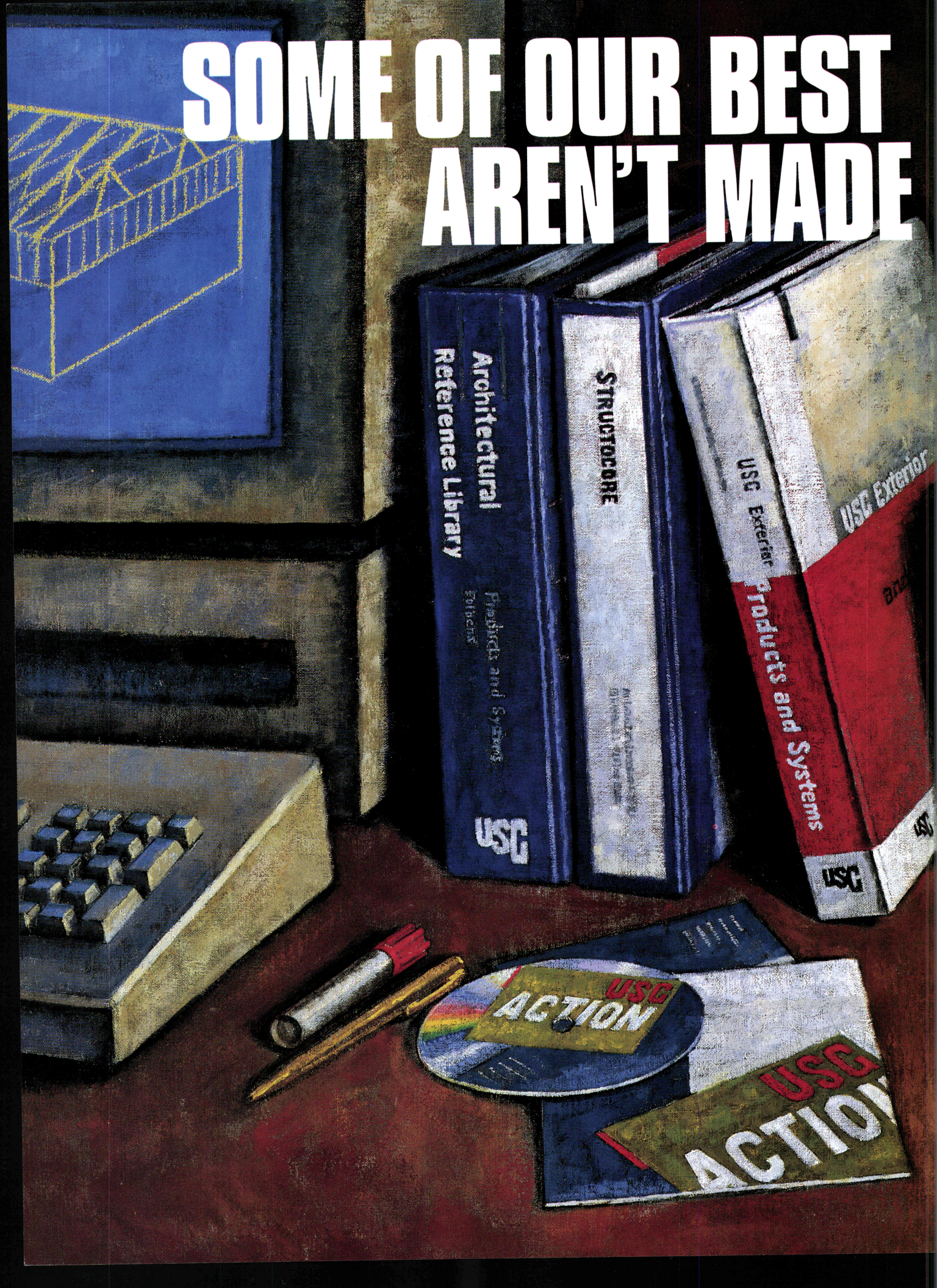
PHOTO: *Staircase in Goetheanum (p.66)*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P/A Evolves

Changing a magazine is like changing planes at an airport. If you know where you're going and if you're not carrying too much baggage, you may make it. Last year, we at P/A decided to fly no longer with the other architectural magazines, giving up the beauty-pageant approach to journalism that has long dominated the field and focusing instead on the changing processes of architecture and on the larger problems facing architects.

P/A has evolved into a magazine that we think will be more useful, more accessible, and more broadly relevant to you, our readers.

But readers were quick to tell us – and we ourselves knew – that we were still carrying too much baggage from the past. So, after gathering reader opinions through surveys and focus groups and after much internal discussion, we have taken last year's direction much further, turning P/A into a more accessible, tough-minded journalistic magazine.

What survived that process of self-scrutiny were many of the innovations we began last year, such as post-occupancy critiques of buildings, and aspects of the magazine, such as Technics, that didn't need fixing. But we have jettisoned the old departmental structure of the magazine, and developed a format and graphics more in keeping with our new direction.

Starting with the cover: you won't find the latest idiosyncratic design enshrined there, but a subject of concern to the entire profession along with a list of other key articles in the issue. The contents page (p. 4) has also changed to include executive summaries of the major articles in the issue. From that summary spread, you will see that we have reorganized the magazine into just two parts. The first is a News section (p. 15) that will summarize important developments in design, practice, and technology, list upcoming events and competitions, briefly review new books, present significant new projects, and evaluate the best of recent products and literature. Readers pressed for time can scan its roughly 16 pages to get a sense of what is new in the field.

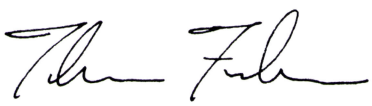
The second section of the magazine will contain feature articles of greater depth on design, technology, and practice. Our coverage of these subjects has changed dramatically from the established norm in the architecture magazines. In design, for example, rather than showing a series of single buildings in splashy presentations, we will discuss bodies of work, such as that of architect Sverre Fehn (p. 50); we will trace design ideas through several projects by one or many firms; and we will analyze design processes, as in the work of the pioneer in prefabrication, Carl Koch (p. 62). We will also be looking ahead to future trends affecting design and we will continue to revisit buildings of the recent past, such as the Columbus Convention Center (p. 78), to evaluate their successes and failures. The editors of this magazine are no longer acting as curators, choosing isolated objects to be exhibited on our pages, but as journalists investigating subjects relevant to our readers.

Throughout the feature section, our coverage of practice and technology will also be more journalistic than before, looking at larger trends, as in the cover story on the profession (p. 44), diagnosing recent failures, such as the Amoco Building's cladding (p. 58), and comparing different approaches to problems, as in the story on curtain wall detailing (p. 70). The Selected Detail page will end each issue (p. 96).

We have also slightly changed the size of the magazine to fit more conveniently on shelves and in file drawers, upgraded the quality of its paper and cover stock, increased the size of the type, and switched to a typeface that is more easily read.

To execute this new editorial/publishing strategy, we established an executive committee of five individuals, all veteran members of the P/A organization, guiding the publication by nonhierarchical consensus (see January P/A, p. 21). One consensus among the editors is that substantial issues in architecture have gone largely undiscussed in the magazines. We are accepting a responsibility to help the profession adapt to the difficult times ahead and to counter the often negative effect the media have had on this field. The image consciousness of the architectural magazines may have suited the 1980s, when the profession seemed driven to create marketable styles. But such journalism also contributed to a public perception of architecture as a kind of fashion – and of the architect as a marginal player on the building team. Altering that perception may be one of the most important efforts of the profession in the coming years. At P/A, we are ready to help.

We would welcome your opinion of these changes to P/A and urge you to use the fax opinion form on page 89.



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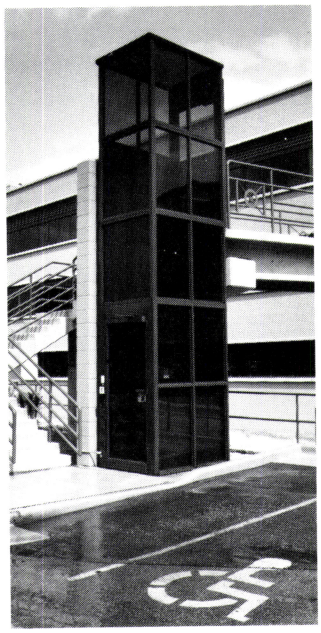

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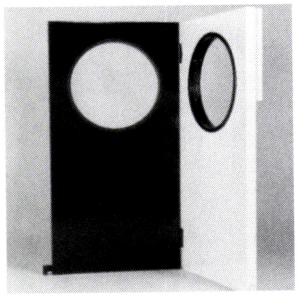

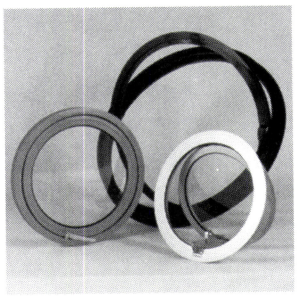

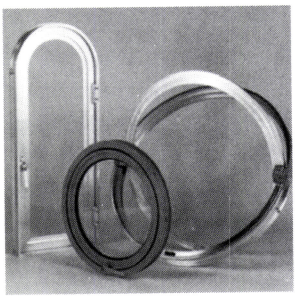

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Views

Progress and Personal Choice

The "Perspective" offered by Dr. Sharon Sutton in the October 1993 issue (page 76) was shallow and short-sighted, as it completely ignored the root causes of problems she seeks to solve and the role of architects in solving them.

1. Dr. Sutton describes architects as "powerless actors in a sociopolitical drama" in an economy dominated by multinational corporations. She continues to argue that the "commodification of land has made architects the servants of venture capitalists" and caused them to participate in the overbuilding and the destruction of the environment.

If architects are anyone's servants, it is by their own choice. First, a small percentage of architects work for large corporations, while the majority are very content to work for clients in their local communities, with more modest budgets and design goals. And part of an architect's job is to help clients clarify the design parameters of their projects, which includes responsible use of the land. On a larger scale, individuals are allowed to participate in the urban planning process by attending meetings of their community's planning department/commission.

2. The author adds that this land-use policy has combined with racial prejudice to encourage suburban sprawl."Suburban sprawl" is not intrinsically evil. Rather, it is an indication that our country's population is growing and that its citizens still believe in and pursue "the American Dream": as the economy changed from an agrarian base to an industrial/commercial base, people (both white and black) moved to the cities, where the jobs were; and as their resources increased, they moved on to the suburbs. Certainly discrimination has slowed this process for many minorities, but it has not stopped the determined ones.

3. As well, she seems baffled by what she describes as architects' lack of power, in spite of their level of education and experience and their growing numbers. She fails to recognize that power is not a gift or a reward for one's accomplishments, but is, instead, something one exercises by choice. And our growing numbers may very well be a hindrance to the exercise of such power. As well, the growth almost certainly accounts for the low fees she mentions, caused by the increased competition for the limited available work.

4. Finally, Dr. Sutton attempts to rally architects to become "catalysts for a more coherent built environment industry": by "developing coalitions of design professionals to provide collective resistance" to social ills.

It is admirable when any individual, in any profession, sees a problem and contributes his skills and expertise to its solution. But to blame the built environment and those who participate in its creation for social ills such as poverty, inequality, and environmental blight, as well as drug and alcohol abuse, unwanted pregnancies and the dissolution of the traditional two-parent family, is nothing short of ludicrous and smacks of "reverse discrimination." Every individual has the responsibility to choose the quality of life he is willing to accept, and to live accordingly. And all of these problems can be minimized, if not eliminated, by maintaining strong family relationships and pursuing the goals to attain that quality of life, through education and work experience.

(continued on page 12)

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(continued from page 10) But Dr. Sutton's perspective is not surprising, given the overall tone of this essay. For, in addition to the emotionally based conclusions, she engages in other not-very- subtle forms of discriminatory language:

a) there is the frequent use of genderless nouns, even in quotes from other sources – any third-grader knows that masculine pronouns are correctly used to denote "men and women" in general, and are not sexist, despite what feminists may think;

b) she constantly cites what she believes to be low numbers of women and blacks within the architectural profession; before these numbers can rise, individual blacks and women must decide, of their own volition, to become architects;

c) and the silliest statement of all: "The L.A. rebellion of 1992 was a next step in the transition from a land-based entrepreneurial economy to a highly mobile corporate one." What bosh!! The L.A. riots (not a rebellion!) were caused by people who attached too much symbolism to "the Rodney King case," instead of taking responsibility for their own lives.

Dr. Sutton is correct in suggesting that architects can be participants in the planning policy process and that they probably should have a louder voice than they do at present. But each architect must make that decision for himself, just as he must choose whom he works for, how he deals with each client, and the fees he charges for his services. And so must every person be accountable for his own happiness and for his own path in life.

Russell W. Toepfer, Architect
Rancho Cucamonga, California

Dr. Sharon Sutton responds:

In *The Progress of Architecture*, I issued a call for architects' heightened responsiveness to a changing society – a call underpinned by overwhelming evidence of our declining professional status. Mr. Toepfer's discovery of reverse discrimination in its lines exemplifies the outrage of many decent individuals who feel embattled by shifts in the nation's cultural and racial landscape. A call such as mine evokes indignation among those for whom preeminence in the sociocultural hierarchy has been customary; it challenges their tacit monopoly on truth.

It would be inappropriate for me to minimize Mr. Toepfer's rage at being asked to honor a different set of rules from the ones he learned as a third grader; it is a lot less painful to charge reverse discrimination than it is to unfreeze a frozen mindset. However, Mr. Toepfer and I agree on one point: Choice is key to empowerment of the architectural (or any other) community – not individual choices that deny responsibility to struggle against inequities in our social structures, but rather collective ones that help us to fashion an environment of caring and inclusion.

CORRECTIONS

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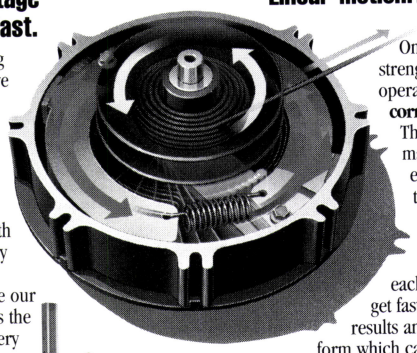

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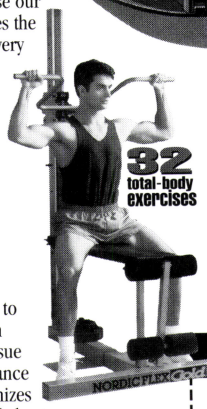

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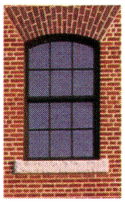

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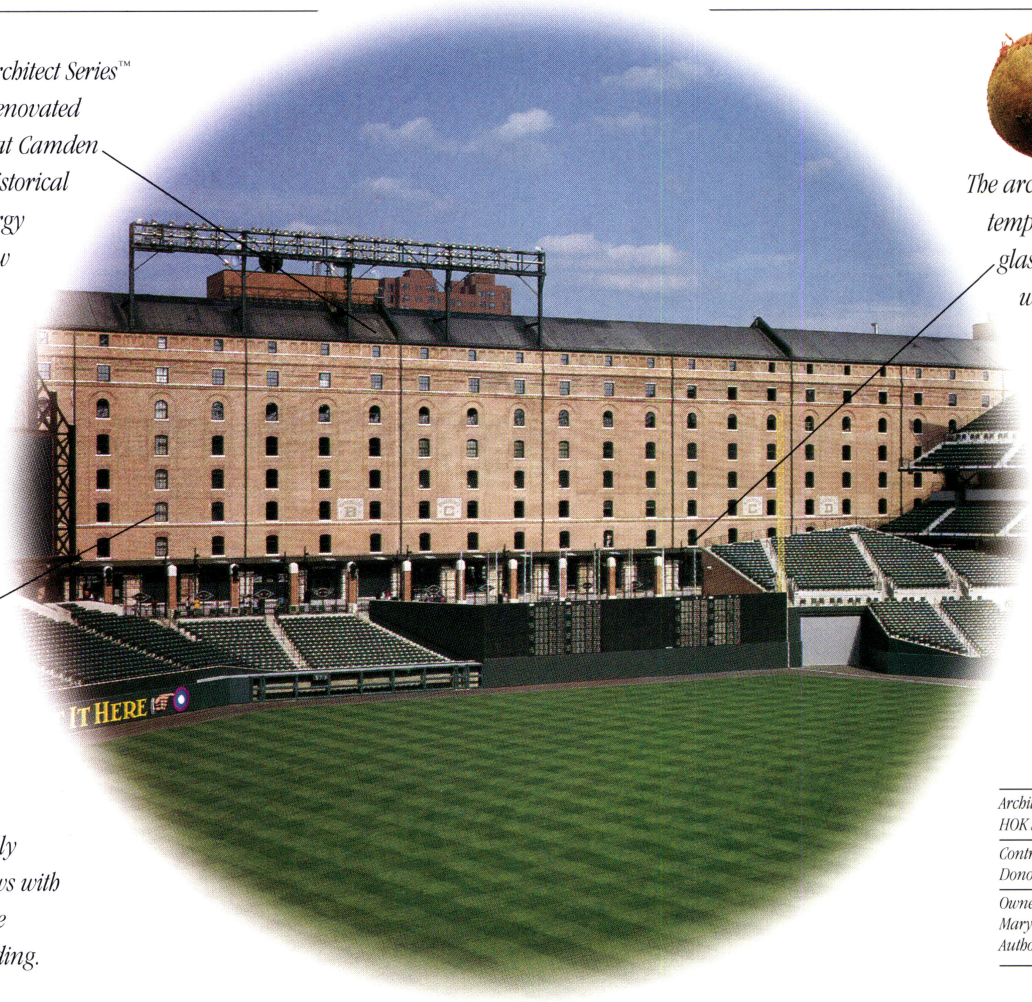

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News

Felice Frankel

AIA Announces Urban Design Awards

An AIA jury has cited four projects with its 1994 Honor Awards for Urban Design. The new awards program replaces the Institute's Urban Design Awards of Excellence; the new name reflects the AIA's intention to give the awards "equal status with the AIA Honor Awards for Architecture" (see page 27). Jurors were Jonathan Barnett, Peter Zweig, and Dorothy Inman Crews. Winners are:

- Charlestown Navy Yard, Boston, overseen by the Boston Redevelopment Authority;
- Post Office Square Park and Garage, Boston, by planners Skidmore, Owings & Merrill, landscape architects The Halvorson Company, architects Ellenzweig Associates, and civil engineers Parsons, Brinkerhoff, Quade & Douglas (P/A, Dec. 1991, p. 19);
- Bryant Park and the New York Public Library Terraces, New York (left), by landscape architects Hanna-Olin, and architects Davis Brody & Associates and Hardy Holzman Pfeiffer Associates and Kupiec & Koustomitis;
- Paternoster Square Redevelopment Master Plan, London, by Hammond Beeby Babka with John Simpson & Partners and Terry Farrell & Company. ■

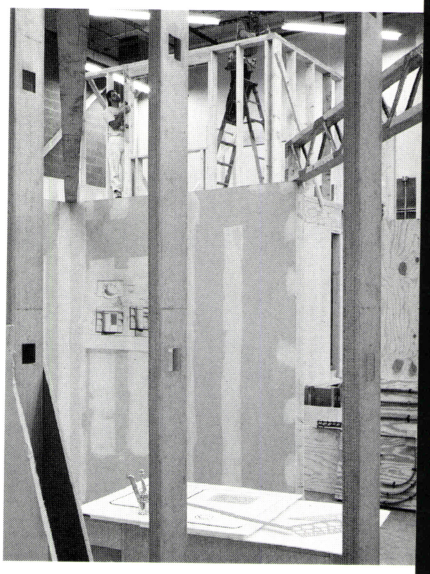
How's the Economy? Pick Your Indicator

Confused about which way the economy is headed? You won't get much help from two recent surveys of design firms. In the second half of 1993, the *Professional Services Management Journal* reported "firm operating profits falling to their lowest levels in ten years," with a drop of 15 percent since last year. In contrast, Birnberg & Associates in Chicago reported that "profit on net revenues ... has rebounded from last year," by 1.5 percent.

Meanwhile, an AIA survey of 300 firms in October yielded mixed economic news: 48 percent reported increased gross revenues in 1993; small and large firms showed best performance. But asked about business opportunities, the end of the recession, and hiring, respondents were less optimistic than in a February poll. ■

Architects and Manufacturers Create New Venture

A coalition of five companies, collectively known as IBACOS, Inc., announced in December that they were conducting research toward "more integrated approaches" to homebuilding. The Pittsburgh group is building test versions (right) of houses that will incorporate "integrated building components and systems" in a kit-of-parts format. The team includes A/E firm Burt Hill Kosar Rittelmann; home products manufacturer Masco; homebuilder Ryland Homes; GE Plastics; and USG. ■



News

John McWilliams

Artist Reuses Pieces of UI/C Campus

While Skidmore, Owings & Merrill's University of Illinois/Chicago campus is undergoing renovation (P/A, May 1993, p. 21), not all of its Brutalist remains went quietly. Last fall, Chicago artist Daniel Martinez (seen at right with original campus architect Walter Netsch) acquired 40 40-ton slabs of granite – dismantled pieces of the campus's raised walkways – and laid them on a nearby vacant lot in defiance of the University's development plans. The site is currently home to an ad hoc weekly market frequented by the area's African-American and Latino populations. In December, the university had the pieces removed. ■

Freed to Design Courthouse

Pei Cobb Freed & Partners, New York, will design a new Federal Courthouse for Omaha, the GSA has announced. Partner James Ingo Freed will be the principal designer; associate architects are Dana Larson Roubal/DLR Group of Omaha. Site selection for the $77-million project is under way. The other finalists were Cesar Pelli & Associates, New Haven; Kevin Roche John Dinkeloo & Associates, Hamden, Connecticut; Perkins & Will, Chicago; and Philip Johnson, New York. ■

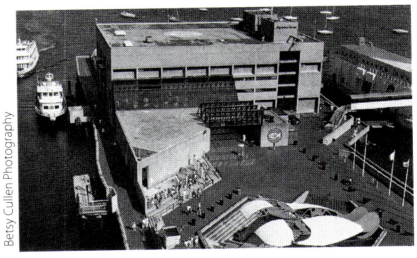
New CEO for Ellerbe Becket

Ellerbe Becket, the nation's largest A/E firm, announced a "new leadership structure" effective January 1. Robert A. Degenhart, an engineer who was most recently the firm's chief operating officer, is the new president and CEO. Former president John Gaunt has left the firm. ■

Roster of Architects for Fire Victims

The Laguna Art Museum, Laguna Beach, California, is creating a directory of architects for Southern California residents whose homes were destroyed during last fall's firestorm. Architects can submit their portfolios to the museum at 307 Cliff Drive, Laguna Beach, CA 92651 (714) 494-8971. ■

New England Aquarium to Expand


Betsy Cullen Photography

The New England Aquarium, a Boston landmark and 1965 P/A Award winner by Cambridge Seven Associates, will be renovated and expanded by a team including Schwartz/Silver Architects, Boston, exhibit designers Lyons/ Zaremba, Boston, and urban design consultants Monacelli Associates of Cambridge, Massachusettes. The decision to expand comes in the wake of a scuttled plan (P/A, Sep. 1990, p. 26) to vacate the building on Central Wharf (left) and build a new aquarium at the Charlestown Navy Yard. ■

Books

Modernity and Housing
by Peter G. Rowe, MIT Press, Cambridge, Massachusetts, 1993, $45.
Harvard's dean, Peter Rowe, argues in this well-researched book that housing best embodies the often conflicting ideas of modernity – standardization, flexibility, abstraction, imitation, rationality, relativity – ideas that are still with us. The book is more an intellectual history and cultural critique than it is a documentation of housing: the photos are small and the plans few.

Breaking New Ground: Developing Innovative AIDS Care Residences
by Betsy Lieberman and Donald P. Chamberlain, AIDS Housing of Washington, Seattle, 1993, $39.95.
Both a resource and a cautionary tale of realistic expectations, this book describes the myriad obstacles (public fears, government regulations) and issues (unpredictable pattern of patient debilitation) organizations must face to develop AIDS care residences.

Architecture Culture 1943–1968: A Documentary Anthology *edited by Joan Ockman in collaboration with Edward Eigen, Columbia Books of Architecture and Rizzoli, New York, 1993, $50 cloth, $35 paper.*
This anthology of 74 international documents traces, through the written word, the evolution of Modern architecture. The commentaries preceding each document are highly informative, though the print size is so small as to be almost illegible – an irony in an otherwise praiseworthy anthology of words.

Alvaro Siza: Works and Projects 1954–1992 *edited by José Paulo dos Santos, Editorial Gustavo Gili, Barcelona, 1993, $65.*
No mere coffee table tome, this monograph on the Portuguese Modernist and 1992 Pritzker Prize winner is analytical in tone. Introductions by Peter Testa and Kenneth Frampton examine Siza's philosophy and methodology; project descriptions demonstrate uncommon depth.

Briefly Noted:

Glass in Buildings *edited by David Button and Brian Pye, Butterworth Heinemann, Stoneham, Massachusetts, 1993, $75.*
Hopkins: The Work of Michael Hopkins & Partners *edited by Colin Davies, Phaidon, London, 1993, $60.*
Paul R. Williams, Architect: A Legacy of Style *by Karen E. Hudson with an introduction by David Gebhard, Rizzoli, New York, 1993, $50.* ■

S. Couturier/Archipress

The Louvre Grandly Opens Another Wing

by Thomas Vonier

Skylighted courtyards and an underground mall dominate the last major phase of I.M. Pei's reorganization.

After years of extensive work that left only portions of original façades and a few rooms intact, the French government this winter unveiled the expertly reconstructed Richelieu wing of the Louvre palace and museum. Opposite I.M. Pei's central glass pyramids and the flanking Denon wing, the Richelieu wing completes the north side of the Louvre's dominant outdoor space, the Cour Napoléon.

The undertaking involved ten different jobs with separate contracts, some with Pei himself as architect, others with Pei Cobb Freed & Partners, and still others with associate architects Michel Macary and Jean-Michel Wilmotte. But Pei is responsible for the overall plan, which continues a reorganization for which the 1989 glass pyramid was truly the tip of the iceberg.

This "new" wing – designed originally by architects Visconti and Lefuel and completed in 1857 under Napoléon III – had served since 1871 as offices for the French ministry of finance, which moved in the 1980s to new quarters along the Seine at Bercy. The Richelieu wing was – and remains – a series of 165 rooms arrayed around three interior courtyards (long used as parking lots). In basic terms, the project involved excavating the courtyards below grade level and covering them with intricate skylights.

The resulting big spaces, which have an open-air quality, ascend in size. The Cour Khorasbad, smallest of them, contains the façade of an Assyrian palace and replicated monumental sculptures from pre-Christian Mesopotamia (P/A, July 1993, p. 77). The Cour Puget and Cour Marly (above) display European sculptures from the Middle Ages to the 19th Century, arrayed on terraces at varying levels. The wing's gallery rooms, on three levels filled with paintings and art objects, overlook the courtyards, the Cour Napoléon, and the arcades of the Rue de Rivoli – or, in the case of Napoléon III's chambers and two new period cafés on the west end, the Cour Carousel, with the Tuileries beyond.

"New Windows onto Paris"

The overall effect is to introduce exhilarating illumination and openness to display spaces. For the first time in memory, visitors see, from inside, the palace's layout and its staggering expanse. As Pei remarked on opening day, "the Louvre now has new windows onto Paris," permitting visitors to perceive parts of the city while moving through its great cultural repository.

The project's most visible and impressive features are its stunning skylights, which bathe the newly covered courtyards in light that spills into adjacent areas. Peter Rice, the late engineer from Ove Arup & Partners, collaborated with Pei and architect Michel Macary in designing the skylights, a complex undertaking involving much study and trial.

The huge skylights had to be low enough in profile to be invisible from the Cour Napoléon and the Rue de Rivoli. Another complicating factor was the trapezoidal plan of the courtyards. Rice's delicate structures cleverly avoid accentuating this asymmetry by adjusting for irregularities over their entire spans. The skylights' structural elements also had to be thin enough not to cast shadows onto art objects below.

Through painstaking calculations and tests, Rice developed wonderfully complex, three-dimensional trusses made of cables and thin struts; they stabilize and carry loads from the skylights at their centers. A meticulously *(continued on page 41)*

News

COMPETITIONS

Affordable Infill Housing Deadline Extended
Deadlines: Registration-February 25, entries-March 23
This is a national ideas competition for affordable infill housing. Contact Columbus Neighborhood Design Assistance Center, 1273 W. Broad St., Columbus, OH 43222 (614) 274-4141.

Affordable Housing on Three Sites
Deadlines: registration-March 4, submissions-May 13
Commissions will be awarded to the winners of this three-site, national, affordable infill housing competition. Contact Bruce Quint, Community Development Corp., 218 E. 500 South, Salt Lake City, UT 84111 (801) 355-7085.

Ceramic Tile
Deadline: submissions-March 15
The 1994 Spectrum Awards honors residential and commercial ceramic tile design. Contact Tile Promotion Board, 900 E. Indiantown Rd., Ste. 211, Jupiter, FL 33477 (407) 743-3150.

P/A Awards for Architectural Research
Deadline: submissions-March 18
P/A announces its first annual P/A Awards Program for Architectural Research, in collaboration with the AIA/ACSA Council on Architectural Research. See p. 37 for details.

Site Furnishings
Deadline: submissions-April 4
Landscape Architecture magazine invites entries in "Movable Landscapes: Site Furnishings, Real and Imagined." Contact *Landscape Architecture* (202) 686-2752.

Calendar

EXHIBITIONS

Renzo Piano Building Workshop
Heinz Architectural Center, Pittsburgh. February 5 – March 27
Work by Piano's firm is on view in this traveling show.

Wright Retrospective
Museum of Modern Art, New York. February 20 – May 10
"Frank Lloyd Wright-Architect" is a major retrospective.

Pedro E. Guerrero

Photos of Wright
Lobby Gallery,
Deutsche Bank, New York.
February 20 – April 1
"Frank Lloyd Wright: A Personal View, Photographs by Pedro Guerrero" includes 25 photos.

P/A's New Public Realm
Historic Wilmington Foundation, Wilmington, N.C.
February 25 – March 25
Public works proposals submitted to P/A's ideas competition (Oct. 1992, p. 73) are on view in this traveling show.

CONFERENCES

Resource Efficient Housing
Dallas February 23 – 26
"Resource Efficiency for the Nineties" is the theme of the Excellence in Housing Conference. Contact Energy Efficient Building Assoc., Northcentral Technical College, 1000 Campus Dr., Wausau, WI 54401-1899 (715) 675-6331, FAX (715) 675-9776.

American Cities
New Haven, Connecticut February 26
HUD Secretary Henry G. Cisneros is among the speakers participating in "The Future of the American City," a one-day symposium. Contact Arts Council of Greater New Haven, 70 Audubon Street, New Haven, CT 06511 (203) 772-2788 or FAX (203) 495-7111. ■

Housing Construction Looking Stronger
The end of 1993 saw a 3.9 percent increase in the rate of housing starts; the Midwest led with an 8.2 percent increase. Multifamily housing has also stopped its several-year slide and some analysts see a slow recovery with the new tax credit for low-income housing.

AIA Introduces Documents for Small Projects
For small-project clients who pale at the sight of the AIA's voluminous contract documents, the Institute has introduced a set of new, simpler documents tailored to small projects such as residential renovation and remodeling. Like all AIA documents, these can be ordered by calling 800-364-ARCH.

Practice Notes

War on Crime May Benefit Architects
The Crime Bill that passed in the Senate at the end of 1993 had good news for architects pursuing prison work. The bill calls for the construction of between 50,000 to 100,000 new prison cells over the next five years, and the development of a series of regional prisons, some of which may be on remodeled military bases.

Study Says Fees Are Highest in Housing
Architectural fees for custom-designed luxury housing (13.5 to 19 percent) are the highest of any building type, says a recent study, *Fees 93*, available from Guidelines (510-254-9393) for $70. Other high-fee building types include hospitals, hotels, and corporate offices.

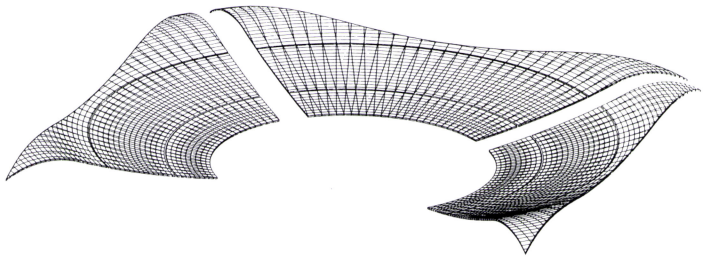
ANSI to Develop Technical Network
The American National Standards Institute (ANSI) has been awarded a $2-million Federal grant to create an electronic infrastructure linking technical databases in the U.S. ANSI says that the network will link the databases of thousands of developers, producers, distributors, and users of technical standards. The joint agency grant is being administered by the National Institute of Standards and Technology. For more information contact ANSI at 212-642-4900.

Technics Notes

Lead Laws
A compilation of Federal and state laws, regulations, and guidance documents pertaining to lead is now available from the National Institute of Building Sciences. The data base, which is on six IBM-compatible diskettes, includes information on lead-based paint testing, abatement, and clean-up. For more information, contact the NIBS publication department at 202-289-7800.

NFRC Directory on Energy Performance
The National Fenestration Rating Council, which rates fenestration products for energy performance, has just published its first certified product directory. It lists U-values for over 2,100 windows, doors, and skylights from more than 60 manufacturers. Copies of the directory are available for $10 from NFRC at 301-589-6372.

Photos, clockwise from top left: Nippon Convention Center; Waterloo International Terminal; Plenary Hall, German Parliament; CRA complex. Drawing below: roof design for L'Oréal factory.



Meaningful Innovation or Razzmatazz?

by Ziva Freiman

American firms lose their bid for the cutting edge in the Quaternario '93 awards for innovative technology. But how radical are the winners?

The International Award for Innovative Technology in Architecture (IAITA) was presented this year to five firms at a two-day architecture conference held in Singapore in early December.

Selected by a jury of five architects from a field of 98 entries, the 1993 winners were: Behnisch & Partners for the German Federal Parliament Building in Bonn; Forbes & Fitzhardinge for the CRA Advanced Technical Development Complex in Victoria, Australia; Nicholas Grimshaw & Partners for Waterloo International Terminal in London; Maki & Associates for the Nippon Convention Center in Tokyo; Valode et Pistre & Associés for L'Oréal's new factory in Aulnay-sous-Bois, Paris. Each of the winning firms was awarded a gold trophy and $20,000.

In pondering the jury's choices, it is interesting that although three American firms were among the 20 finalists (Kohn Pedersen Fox for 1250 Boulevard René Levesque in Montreal; SOM Chicago for 100 Pratt Street in Baltimore; and Murphy/Jahn for Munich Order Center), none were premiated. Their absence was the topic of some speculation among delegates, coming at a time when competition is heating up between European and American firms in the Asian arena: judging by the construction going on in Singapore itself, the prestige carried by any claim to technological leadership is enormous, and readily translates into commissions; the effective shut-out of Americans from this year's Quaternario awards may have some regional repercussions.

Secondly, in surveying both winners and finalists, one has to question how many buildings represent substantial advances that go beyond their admittedly dazzling engineering.

On the Conference

The IAITA program is sponsored by two manufacturers of building envelope components, Permasteelisa Group and Structal Group, to provide incentives for technical innovations in commercial and public building construction; residential and infrastructural projects are as yet not eligible for the award. Conceived by Permasteelisa president Massimo Colomban, the first IAITA conference was held in Sydney in 1988, subsidized largely by the company's Quaternario Foundation. The second Quaternario awards took place in Venice in 1990.

Close to 800 delegates from four continents (none from Africa) attended Quaternario '93. The conference's first day was technology-oriented, focusing on current practices and advances in curtain wall design, testing, and construction. The second day was devoted to more general topics, including presentations by the winning firms and by jury members Sir Norman Foster, Sir Richard Rogers, Philip Cox, Emmanuel Cattani standing in for his partner Jean Nouvel, and Singapore architect Tay Kheng Soon.

While the expert papers on curtain wall technology heralded no conclusive breakthroughs, promising directions for future research were noted: among these, as reported by a number of speakers, was the growing interest in finding mathematical models for perennially problematic areas of curtain wall design. "The curtain wall industry, although utilizing advanced scientific methods of structural analysis, still relies on empirical knowledge for many aspects, including waterproofing," explained John Perry of Arup Façade Engineering in Australia. "This practice needs to be reversed so that theoretical analysis at a sophisticated level can provide proof of design validity. Evaluation of nonlinear behavior, fabric thermal analysis, and pressure equalization through computational fluid dynamics are all areas with potential to satisfy these needs."

Sustainability and Development

Of the jurors' presentations, most interesting were the talks given by Tay Kheng Soon and Norman*(continued on page 42)*

Remembering Charles Moore

by Sally Woodbridge

Editor's Note: Charles Moore, the acclaimed architect, writer, and teacher, died on December 16 from a heart attack at his Austin, Texas, home. He was 68 years old. The following remembrance was written by Sally B. Woodbridge, P/A's Bay Area correspondent, a friend and collaborator of Moore's.

Charles Willard Moore was the embodiment of that many-sided ideal of western civilization, the Renaissance man. He designed, he wrote, and he taught with acumen, grace, and wit. He was insatiably greedy for the good stuff in life: companionship, objects of delight, experiences of buildings and places, opportunities to design and build. He traveled the world amassing a treasury of memories which he wove into the fabric of his own work. Collaboration was his *modus operandi*; his muse was not activated unless others were sitting around the table. But, as his collaborators have noted, Moore's hand held the pencil that drew the definitive scheme.

Although wit played a role in his architecture and filled his drawings, it was, in my opinion, most delectably displayed in his writing. Although not usually listed among his credits, his magazine articles made him one of the liveliest critics the architectural press has had. Who else thought up titles like "Eleven Agonies and One Euphoria" (in the Michigan Society of Architects Bulletin) and "The Establishment Invites You to Join in Hushed and Sumptuous Appreciation of the Several Arts, Lincoln Center, Most Evenings, Arrival Optional but Difficult" (in *Architectural Forum*)? He also coauthored books such as *The Place of Houses* that changed the lens through which people viewed buildings in the environment.

As an intellectual, he cultivated a broad literacy in architectural theory and the world of letters, and often sought to bring the two together. In the mid-1980s, for example, the publication of *The Memory Palace of Matteo Ricci* by Jonathan D. Spence inspired him to teach a studio in which the students designed their own memory palaces.

Moore was a well-known dissident from the pure doctrine of Modern architecture. In an essay for the catalog of his 1986 exhibition at Williams College (titled, "The Yin, the Yang, and the Three Bears"), he cited the early Modern manifestoes that proclaimed the death of a "shackling past" as belonging to the century's yang phase, and wondered if the yin phase that now loomed might be one of "absorbing and healing and trying to bring our free-standing erections into an inhabitable community." Yet his dissidence did not involve a retreat from rules and learning. Far from it. He concluded his student years at the highest level with a Ph.D. from Princeton University in 1957. Over time he held faculty appointments at five universities, including the top posts at the University of California, Berkeley, and Yale University.

No one has evaluated Moore's career better than Moore himself in the essay cited above, in which he stated that his buildings "should not be seen as signposts to some Architectural Utopia or some Big Revelation, or to some perfectible style, but rather as attempts better to gather into structures the energies of people and places. These attempts come from a belief that the world contains an astonishing number of wonderful places, fancy and plain, large and tiny (or somewhere in between). My own most worthy contribution, I believe, is that I have encouraged (it used to be decried) looking at places and listening to people, acknowledging the sources, even exulting in them, adding our own energies, care and love, and even joy, if we have that in us."

Those who mourn Moore might consider how to replenish the stock of energy, care, love, and, most poignantly, joy that his passing has taken from the world. ■

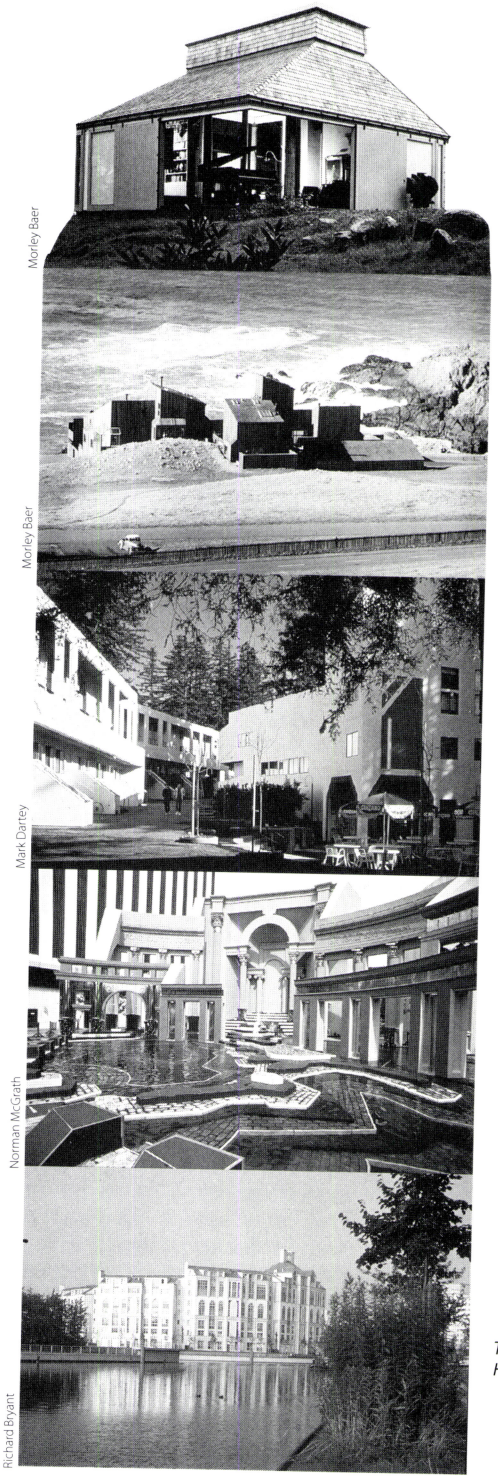
A major book on Moore's life is in progress. Any photographs, drawings, or reminiscences would be appreciated. Please contact Kevin Keim at Moore Andersson Architects, Austin, Texas (512) 476-5780.

Moore's Life: a Chronology

1925 born, Benton Harbor, Michigan
1947 earns B. Arch., University of Michigan
1950 begins teaching at the University of Utah
1952 enters the Army Corps of Engineers for a two-year tour of duty
1957 earns Ph.D. from Princeton and begins teaching there
1959 accepts associate professor position at Berkeley
1962 enters partnership with Donlyn Lyndon, William Turnbull, and Richard Whitaker (MLTW); designs own house in Orinda, California; becomes chairman of Berkeley architecture department
1964 MLTW designs Condominium I at the Sea Ranch, California
1965 becomes chairman of the Department of Architecture at Yale; work exhibited in Architectural League's "40 Under 40" show; publishes "You Have to Pay for the Public Life" in *Perspecta*
1968 designs Church Street South housing in New Haven, Connecticut, and Faculty Club at UC-Santa Barbara, both with MLTW
1969 designs Kresge College at UC-Santa Cruz with MLTW; becomes full professor and dean of the School of Architecture at Yale
1970 MLTW partners separate; Moore starts solo practice
1971 resigns as dean at Yale but continues as a Professor; becomes consultant to newly formed Urban Innovations Group (UIG) at UCLA
1974 publishes *The Place of Houses* with Donlyn Lyndon and Gerald Allen
1975 forms new firm, Moore Grover Harper, Essex, Connecticut (later renamed Centerbrook Architects); becomes professor of architecture at UCLA; designs Piazza d'Italia in New Orleans with UIG and August Perez Associates
1976 forms another firm, Moore Ruble Yudell (MRY), in Los Angeles; exhibited at Venice Biennale
1977 publishes *Body, Memory and Architecture* with Kent Bloomer
1978 becomes program head at UCLA
1980 designs St. Matthew's Church, Pacific Palisades, California, with MRY
1982 wins competitions for Tegel Harbor Housing, Berlin(with MRY)and Beverly Hills Civic Center (with UIG and Albert C. Martin & Associates)
1983 designs Hood Museum of Art at Dartmouth College with Centerbrook
1985 becomes Professor of Architecture at the University of Texas; opens new practice with Arthur Andersson
1989 wins AIA/ACSA Topaz Medallion for architectural education
1991 wins AIA Gold Medal

AIA Honor Awards: Sea Ranch Condominium I, 1967; St. Matthew's Church, 1980; Hood Museum, 1987; Tegel Harbor Housing, 1988.

P/A Awards Recognition (citations except where noted):
Charles W. Moore Architect: Moore House, 1962; West Plaza Condominiums, Coronado, California, 1963.
With MLTW: Jewell House, Orinda, California, 1964; Sea Ranch Condominium I, Gualala, California, 1965; Sea Ranch Athletic Club, 1966; Rent Supplement Apartments, Whitesburg, Kentucky, 1969; Pembroke College Dormitories, Brown University, 1970 (First Award); Kresge College, University of California, Santa Cruz, 1970.
With August Perez Associates: Piazza d'Italia, New Orleans, 1976.
With Moore Grover Harper: Waterfront plan, Dayton, Ohio, 1977.



Morley Baer

Moore House, Orinda, CA

Morley Baer

Condominium I, The Sea Ranch

Mark Darley

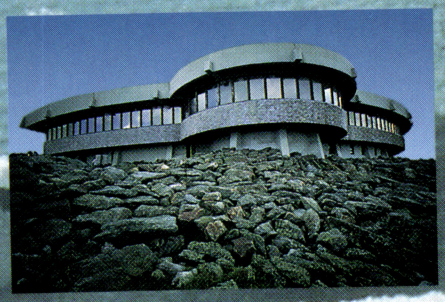
Kresge College, UC, Santa Cruz

Norman McGrath

Piazza d'Italia, New Orleans

Richard Bryant

Tegel Harbor Housing, Berlin



The Sherman Adams Summit Building, built into the top of Mt. Washington, 6,288 ft above sea level, site of the world's worst recorded weather.

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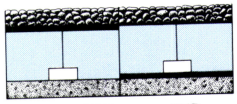

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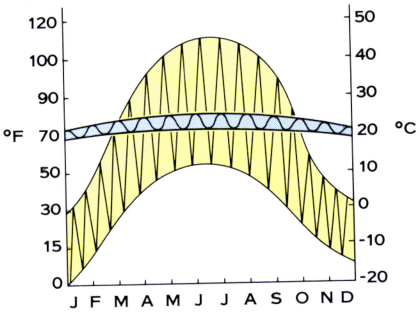
Whenever you're building in conditions that make the roof vulnerable, choose the system you know you can count on. The PMR System with ROOFMATE tops them all.

MEMBRANE TEMPERATURES



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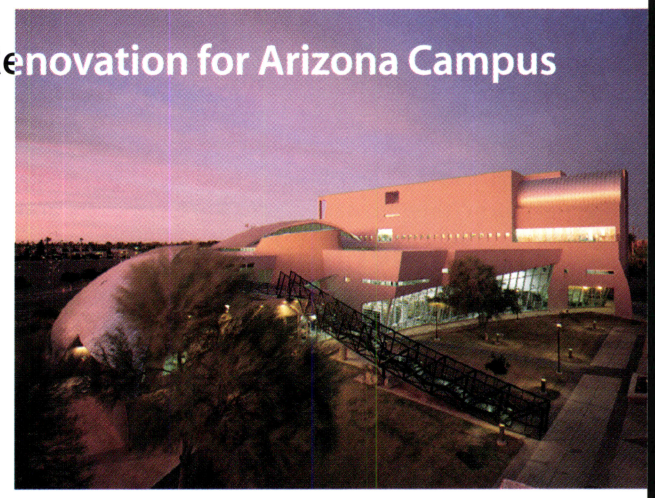
Steven Evans

Kitchener City Hall is Complete

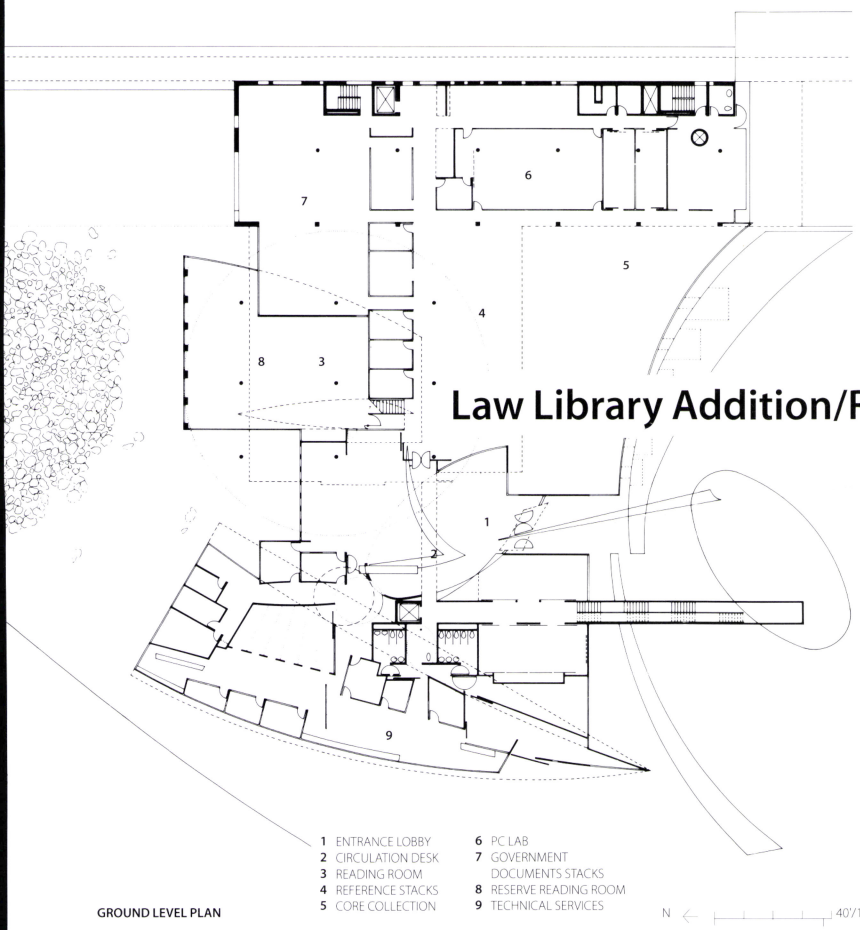
Kuwabara Payne McKenna Blumberg's design for the Kitchener, Ontario, city hall captured wide attention when it won an open competition in 1989. Completed this fall, the building appears to have lived up to its promise of an elegant civic Modernism. The building's most visible civic features are a clerestory-topped rotunda, a tower with a fiber-optic weather beacon, and an open square with a skating rink. The city hall is the first major civic building by the Toronto architects (P/A, Oct. 1992, p. 96), who are former associates of Barton Myers.

Law Library Addition/Renovation for Arizona Campus

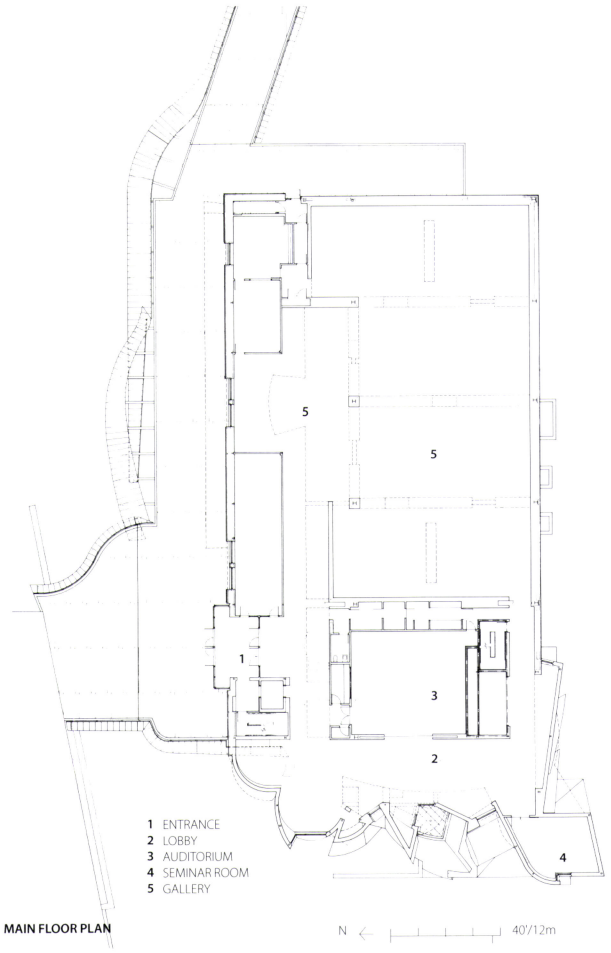
The recently completed John J. Ross - William C. Blakley Law Library at Arizona State University in Tempe by Scogin Elam & Bray, Atlanta (P/A, Dec. 1990, p. 60), involved 67,755 square feet of new construction and a 17,000-square-foot renovation; the library now houses 310,000 volumes, research facilities, and meeting rooms. The addition's animated roof lines and free-form volumes were designed in contrast to the orthogonally planned campus and the strong geometry of the existing law school building. The fragmented volumes and spaces are organized over and around distinct functions of the library.



©Timothy Hursley



GROUND LEVEL PLAN

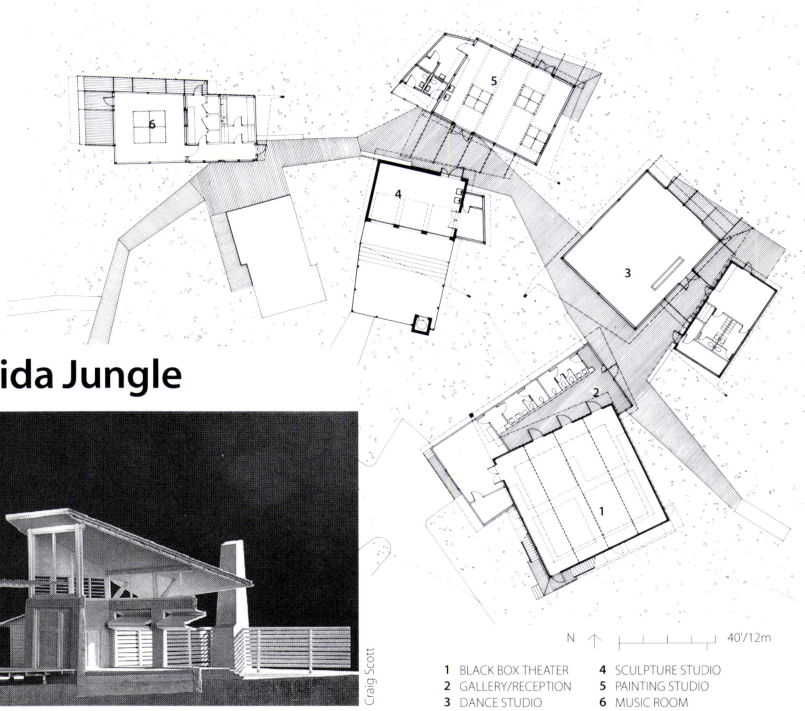


MAIN FLOOR PLAN

Warren Bruland

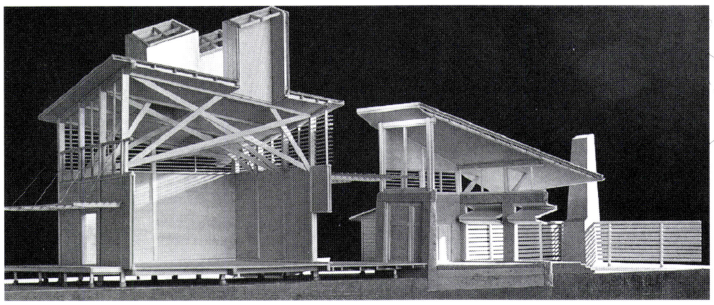
Gehry Museum Shows Best Face to the Mississippi

The Frederick R. Weisman Museum of Art, a Citation winner in the 1992 P/A Awards, opened in November at the University of Minnesota in Minneapolis. Frank O. Gehry & Associates, the architects, have produced what juror Stanley Saitowitz called "a warehouse with a decorated wall," as a look at the plan will indicate: all of Gehry's characteristic expressionism is concentrated on the stainless steel façade overlooking the Mississippi River. Lest you wonder what kind of interiors such a strategy yields, *New York Times* critic Herbert Muschamp called them "five of the most gorgeous galleries on earth."

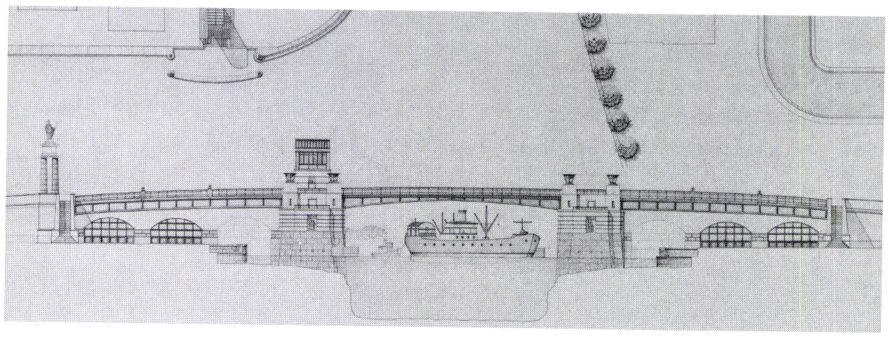


Arts Center Addition in the Florida Jungle

In a year's time, a collection of quirky, wood-frame artists' studios linked by a serpentine boardwalk will rise on a jungle site near New Smyrna Beach, Florida. The addition to the Atlantic Center for the Arts, a nonprofit artist-in-residence program currently housed in several wood-frame pole structures, is by Thompson & Rose, Boston, (P/A, July 1990, p. 58). The sensory effects of the jungle climate and vegetation inform the design. Each building, programmed to house a single art form (theater, dance, sculpture, painting, and music) is a simple volume with adjustable louvers, large glass walls, stained cypress cladding, and lead-coated copper roofs.

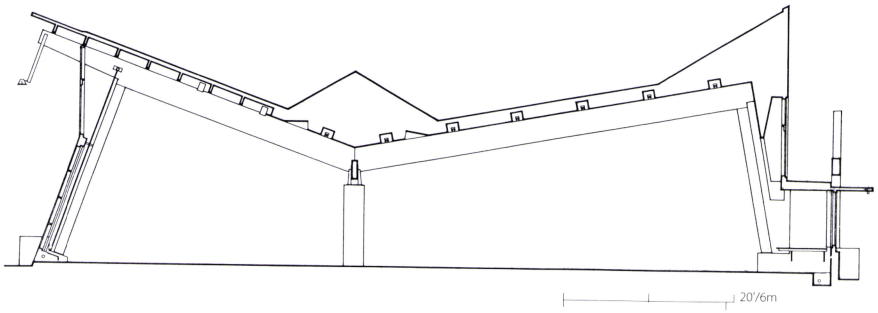


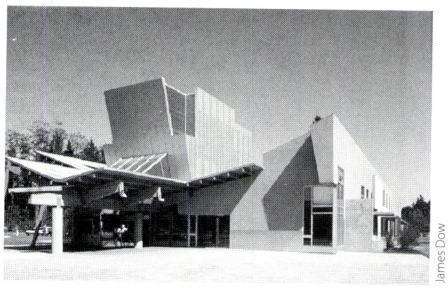
Craig Scott



New Bridge to Highlight Miami History

"The myth of foundation" of the city of Miami is the theme for a new drawbridge that will soon be constructed in downtown Miami. The concrete-and-steel bridge will replace an existing one where U.S. 1 crosses the Miami River. It incorporates bronze sculptures of Miami pioneers and a commemorative column honoring the Tequesta Indians who once lived on the river banks. Portuondo Perotti Architects of Coral Gables, Florida, produced the competition-winning design.

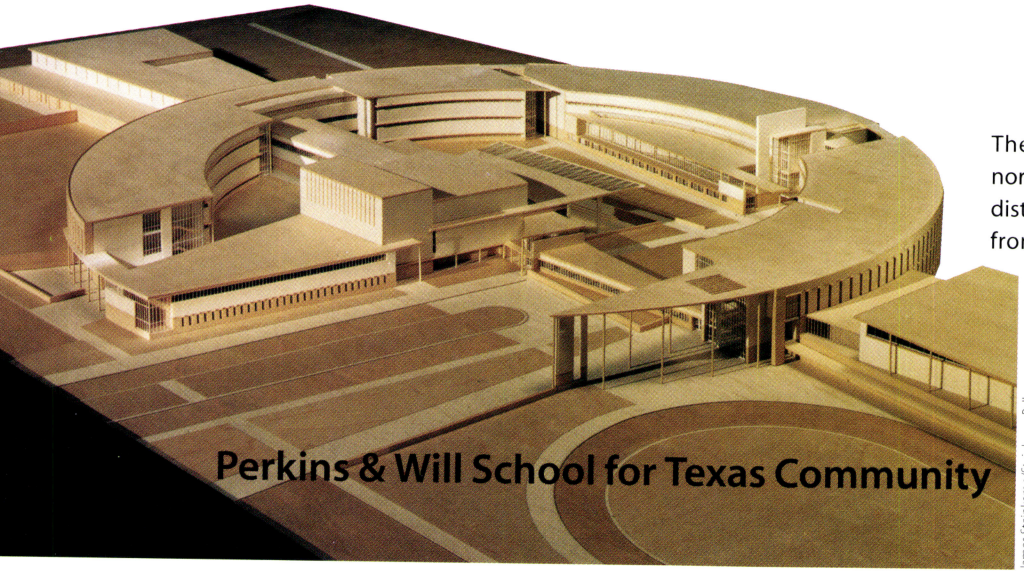




James Dow

Patkau Designs Urbane Library for Vancouver Suburb

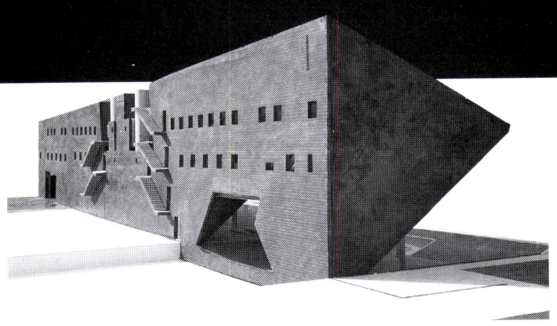
With the new Newton Library, Patkau Architects, Vancouver, winners of a 1993 P/A Award, continue to explore the relationship between the built and natural environments often using zoomorphic forms. The 16,000-square-foot library stands out amid the conventional housing and diffused planning of Surrey, a suburb of Vancouver, British Columbia; its unconventional design offers a small degree of centeredness in an otherwise nondescript landscape. The design is not gratuitous, however: In section, the roof of the single-story building resembles a shallow, asymmetric V; water collects in the fold of the roof, and cascades off through two spouts to piles of stones where it is absorbed into the earth.



James Steinkamp/Steinkamp Ballogg

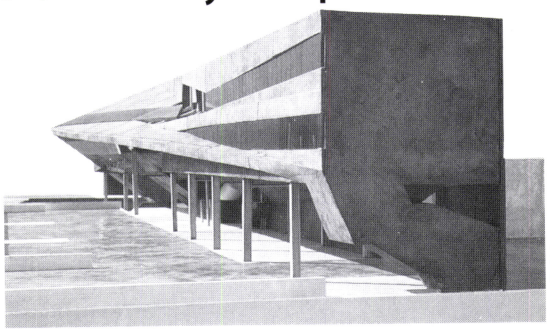
Perkins & Will School for Texas Community

A new high school by Perkins & Will for The Woodlands, a planned community north of Houston, uses bold geometry to distinguish its strictly academic functions from those shared with the community. A circular classroom building surrounds a courtyard 350 feet in diameter, while two grids – those of the adjacent streets and of the cardinal directions – determine the positions of the public facilities (performing arts center, gymnasium, library, cafeteria). The $27-million project is to be completed in August 1995.

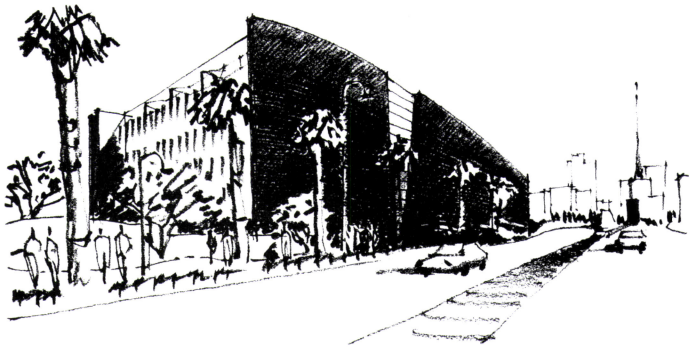


Moss Splices Theater/Office into Culver City Complex

With the Hercules Theatre and Office Project, Eric Owen Moss continues his longstanding relationship with client Frederick Norton Smith, owner of several converted industrial complexes in Culver City, California (P/A, May 1991, p. 98). Moss's design includes the rehabilitation of two adjoining 20,000-square-foot bowstring-truss-roofed bays, enclosed by a new 325-foot-long masonry wall. A third bay was demolished for the excavation and removal of petrochemical waste. Planned for the excavated site is a sunken grass court with open-air seating facing a new black box theater/stage to be built into the bowstring structure. The exterior finish is steel-troweled black plaster. Construction is to begin in June.

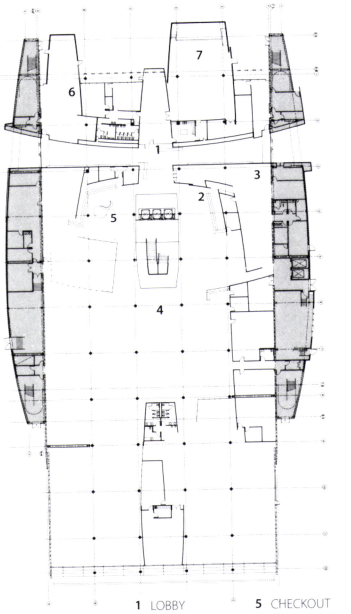


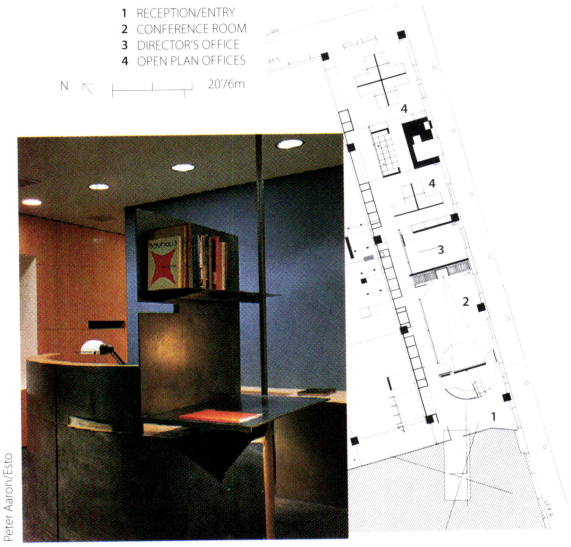
Photos: Todd Conversano



New Central Library for Phoenix

William Bruder's largest commission to date, the 280,000-square-foot Central Phoenix Library, is designed to rise above the city's Central Avenue like a mesa in the Arizona desert; as with the Phoenix architect's Murray House (P/A, Nov. 1990, p. 74), the library's massing is composed to both contrast with and complement its context. To signal its mission to the community, the library's stacks will be visible to passersby through all-glass north and south elevations (outfitted with automated solar tracking louvers and a system of teflon-coated fiberglass shade sails, respectively). The concrete, copper, stainless steel, and glass building, with a five-story central atrium/light well, is to be completed by spring 1995.





Peter Aaron/Esto

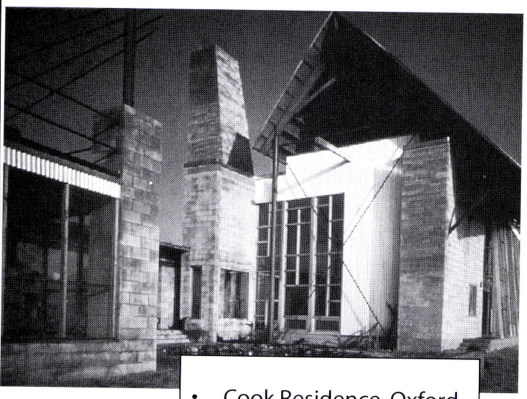
AIA New York Chapter Offices by Hanrahan & Meyers

When a steep rent hike forced the AIA New York Chapter to vacate its longtime home in the stately Urban Center on Madison Avenue, the board of directors found itself searching for an affordable alternative. With low-rent digs secured in a prewar loft building designed by Ely Jacques Kahn, the chapter held a design competition for the 1,800-square-foot interior. The winning scheme by Thomas Hanrahan and Victoria Meyers, New York, recipients of two 1993 P/A Awards citations, uses "articulated elements" – such as a steel reception desk and a wood storage wall – to accommodate the program and create a fluid spatial experience. Many of the materials and services, including the architects', were donated or reduced in cost.

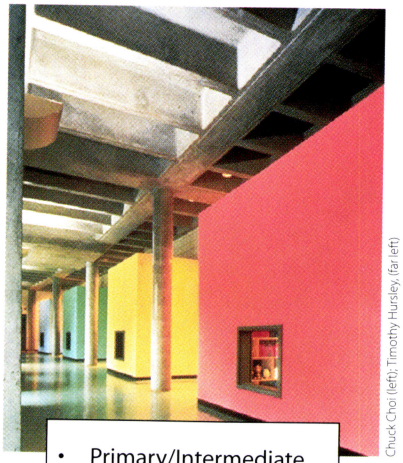
David Hewitt & Anne Garrison

- The Simone Hotel, Los Angeles, by Koning Eizenberg Architecture, Santa Monica, California

17 Win AIA Honor Awards



- Cook Residence, Oxford, Mississippi, by Mockbee/ Coker Architects, Canton, Mississippi



Chuck Choi (left); Timothy Hursley (far left)

- Primary/Intermediate School 217, New York, by Michael Fieldman & Partners, New York (P/A Plans, Mar. 1992, p. 80)

Jeff Goldberg/Esto

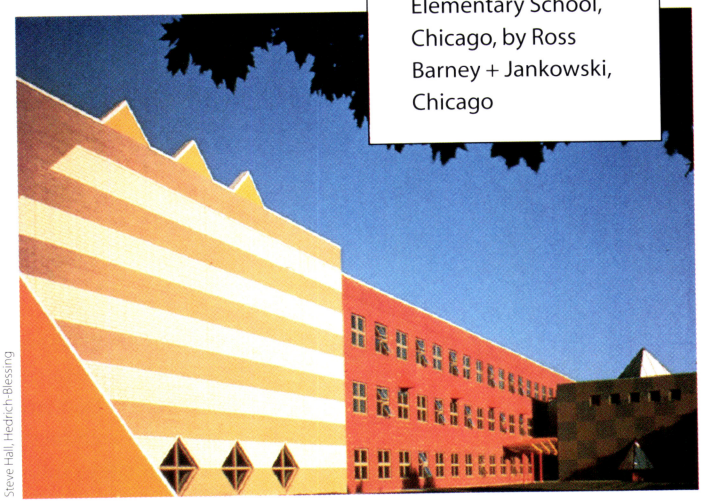
- Oriole Park at Camden Yards, Baltimore, by Hellmuth, Obata & Kassabaum Sports Facilities Group, Kansas City, Missouri (P/A, June 1992, p.26)

An AIA jury has selected 17 projects for its 1994 Honor Awards, reflecting what jury chairman Donlyn Lyndon called "the scope of the architect's involvement in building society's future." The list does offer a wider-than-usual variety of scales and building types – from James Cutler's Salem Witch Trials Memorial to HOK's Camden Yards baseball park. Not pictured:

- Salem Witch Trials Tercentenary Memorial, Salem, Massachusetts, by James Cutler Architects, Bainbridge Island, Washington (P/A, Aug. 1993, p. 70);
- Daybreak Grove, Escondido, California, by Davids Killory, San Diego (P/A, Jan. 1991, p. 96);
- The Chrysler Museum, Norfolk, Virginia, by Hartman-Cox Architects, Washington, D.C., with associate architect Shriver & Holland Architects, Norfolk;
- Computer Science Building, Princeton University, Princeton, New Jersey, by R.M. Kliment & Frances Halsband Architects, New York;
- United States Holocaust Memorial Museum, Washington, D.C., by Pei Cobb Freed & Partners, New York, with associate architects Finegold & Alexander, Boston (P/A, Feb. 1993, p. 60);
- The Cooper Union Residence Hall, New York, by Prentice & Chan, Ohlhausen, New York;
- Rowes Wharf, Boston, by Skidmore, Owings & Merrill, Chicago (P/A, Jan . 1988, p. 47).

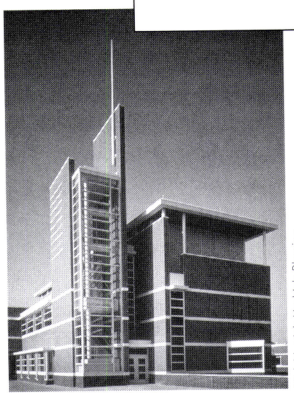
(winners continued on next page)

- Cesar Chavez Elementary School, Chicago, by Ross Barney + Jankowski, Chicago



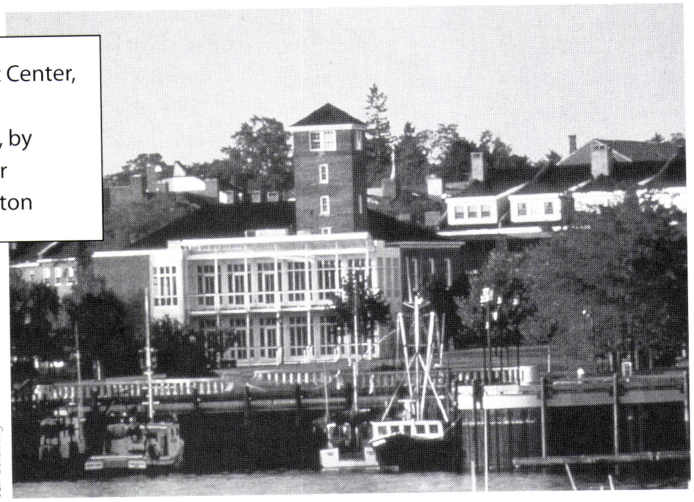
Steve Hall, Hedrich-Blessing

- Troy High School, Troy, Michigan, by Perkins & Will, Chicago

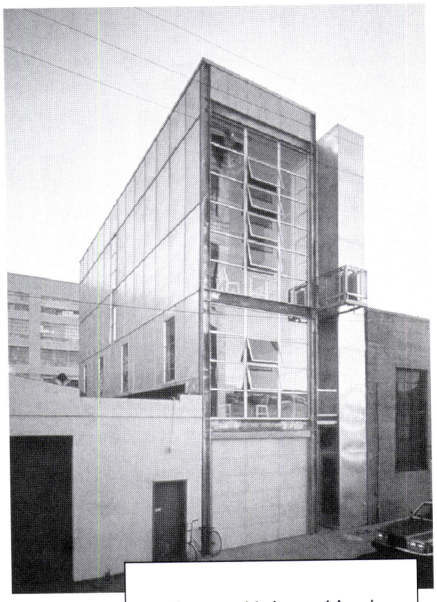


Nick Merrick, Hedrich-Blessing

- Firehouse Civic Center, Newburyport, Massachusetts, by Schwartz/Silver Architects, Boston



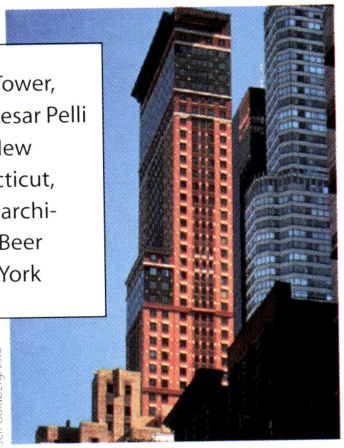
Jeff Goldberg/Esto



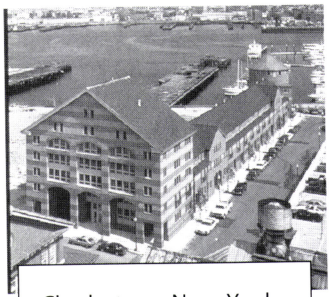
Thomas Heinser

- Corson Heinser Live/Work, San Francisco, by Tanner Leddy Maytum Stacy Architects, San Francisco

- Carnegie Hall Tower, New York, by Cesar Pelli & Associates, New Haven, Connecticut, with associate architects Brennan Beer Gorman, New York



Jeff Goldberg/Esto



Steve Rosenthal

- Charlestown Navy Yard rowhouses, Boston, by William Rawn Associates, Boston (P/A, Oct. 1988, p. 66)

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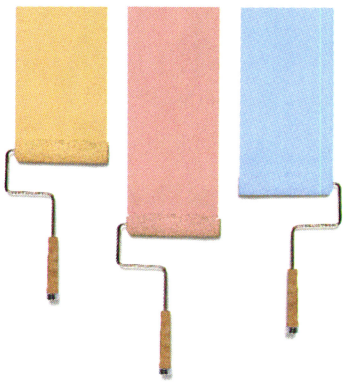

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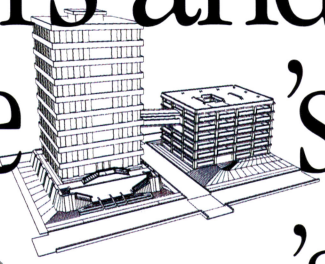
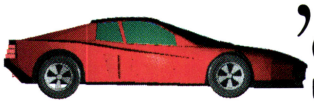
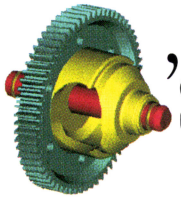
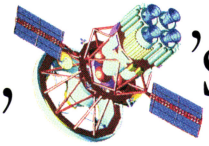
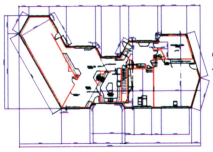
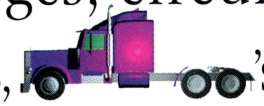
you can do Windows™ and walls and doors and floors, ceilings, whole  's,  's, trains, boats, 's, chains, 's, diamond rings,  's and things,  's, power plants, topo maps,  's, helicopters, roads and bridges, circuit boards, 's power lines,  's, airports, furniture, , digital terrain models, 's, skateboards, the 's, chemical plants, 's, golf courses, anything you can think of ... even the kitchen .

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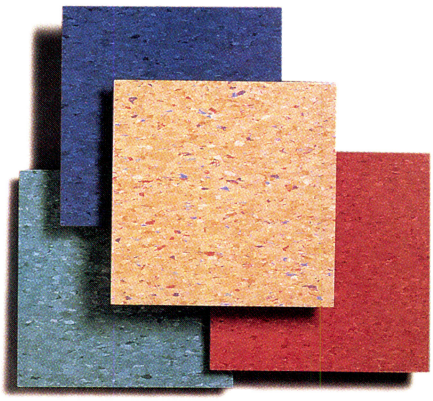
Chair by Lehrecke

Part craftsman, part furniture designer, Chris Lehrecke of Brooklyn, New York, has assembled a distinguished body of work over the past few years. Among his latest designs is a chair with a laminated Finnish plywood seat and blackened bronze structural elements. Its concave seat back and the animated stance of its legs, demonstrate Lehrecke's innate understanding of materiality.
Circle 100 on reader service card



Vinyl Composition Tile Introduced

Mannington Commercial has introduced its first collection of vinyl composition tile (VCT). The manufacturer has developed two series of tiles with a 60-color palette and true through-pattern construction. Essentials comes in 48 base-grade colors (bold tones, pastels, earth tones, etc.) and Inspirations is available in 12 color medleys using multiple flecks of colors from Essentials.
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Traditional Millwork

A new brochure from Architectural Components, designer and manufacturer of custom-made period millwork, includes information about the company's new line of traditionally detailed, true-divided-lite wood windows and French doors with narrow muntins and insulated glass. With one-inch or one-and-one-eighth-inch muntins and narrow profiles, complete window units or replacement sash are available in a variety of custom shapes and sizes, including double-hung, bay, bow, and casement windows. Glazing options include hand-blown Restoration Glass, double-sealed insulated glass and Low-E glass. Standard materials are clear, kiln-dried, Eastern white pine or mahogany. The company's other products and services are also described in the brochure.
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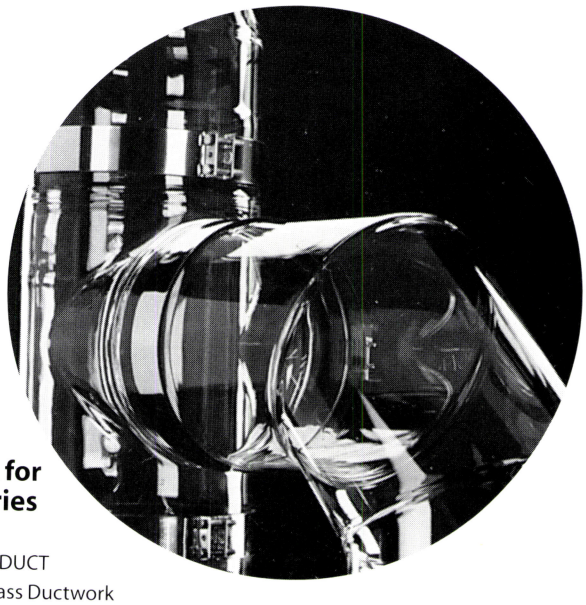

Glass Ductwork for Laboratories and...

A new SAFE-T-DUCT Borosilicate Glass Ductwork brochure is now available from the Laboratory Systems Division of Schott Process Systems. Designed for safe venting of corrosive laboratory fumes, the ductwork, an air-tight, corrosion-resistant product, is offered as an alternative to stainless steel ducts, though this unusual product is suitable for nonlaboratory installations. The brochure includes specifications and dimension drawings/sizing information on the complete line of duct fittings, coupling/supporting hardware, and accessories.
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Waterbased Flooring Adhesives

The DriTac® Adhesive Group's waterbased flooring adhesives are free of chlorinated solvents and conform to the U.S. Clean Air Act of 1990, which will ban the use of such solvents in all adhesives by 1995. DriTac® products can be used to install wood, vinyl, and rubber flooring, and carpet.
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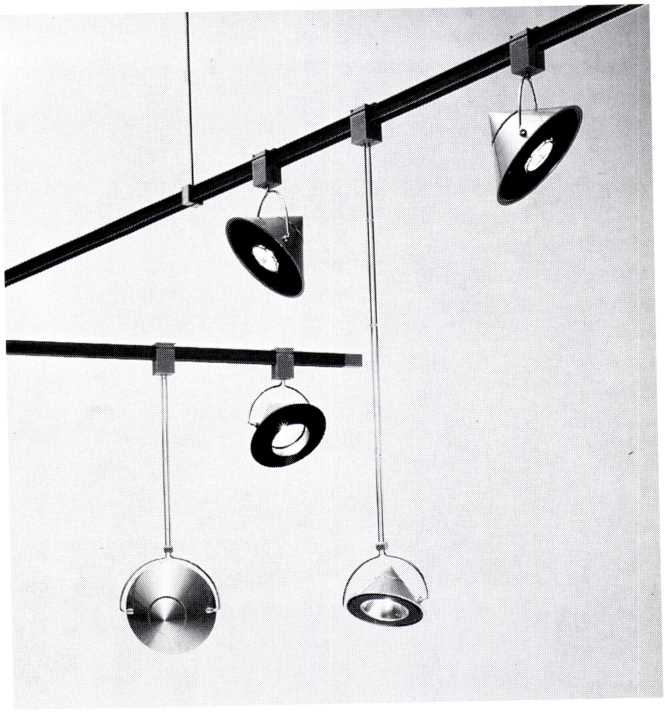

Reengineered Track Lighting System

Originally launched three years ago, the Mikado low-voltage, halogen track system has undergone a major design, technical, and engineering rehaul by its designer, F.A. Porsche, and its manufacturer, Artemide. The result is a more comprehensive package including: spotlights that can be positioned anywhere on the conductor profile; quick snapping spotlight adaptor; new rod-extended spotlights; and a flexible installation procedure with remote transformer or canopy incorporated transformer.
Circle 103 on reader service card

Modernist Textiles Reinterpreted

Unika Vaev USA has produced a collection of woven textiles interpreted from printed textiles designed in the 1940s and 1950s in the U.S. by German emigré Ruth Adler Schnee, part of the manufacturer's ongoing revival of work by early and mid-century Modernists. Schnee, in collaboration with Suzanne Tick of Unika Vaev USA, chose to revive her Nosegay (shown) and Central Park in printed casement and woven upholstery weights and Germination in 100 percent woven rayon. Schnee is now a practicing architect in Detroit.
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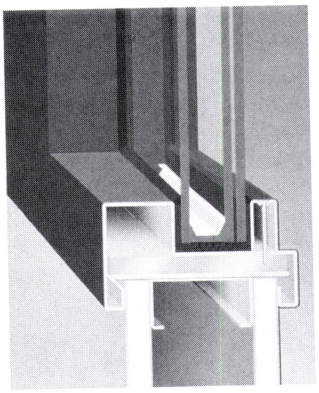

High Security Glazing

O'Keeffe's CONTRACRIME™ is a new high security and fire protection glazing specifically designed for institutional applications. The glazing, composed of a polycarbonate interlayer sandwiched between a tempered lite and one-inch-thick Contraflam, has an attack resistance of 17.55 minutes. Breakage-activated integral alarm wires for security systems may be specified.
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]-Purpose iture for Kids

er-Link™, manufactured ols, is a stackable, linkable, hick bent-plywood k. Designed by architect ivari of Zivari Design, New ne modules can be linked by ren – above the age of five – form a variety of configurations, from an undulating line to a circle of 20 stools (nine feet four inches in diameter). Suitable for schools, childcare centers, libraries, and residential applications, the stools are 12 inches high, 21 inches wide, and 18 inches deep, and weigh 5 ½ pounds each; they have a nontoxic finish and are washable.
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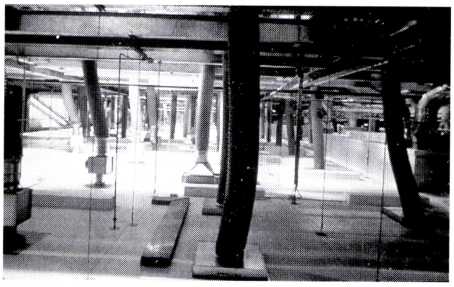

Walkable Maintenance Ceiling

Sylab, from Clestra Cleanroom, is a walkable ceiling designed as an alternative to catwalks, to support the weight of maintenance staff servicing lights, filters, and environmental control sensors. The individually load-bearing, fully insulated panels (in carbon steel with a baked-on paint system or stainless steel) do not require any additional structural framing and are suitable for negative pressure or low humidity and vapor-tight projects. Panels are available in many shapes, sizes, and colors.
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Standing Lamp by Marc Newson

Marc Newson, best known for his organically shaped aluminum chaise longue, has designed a new halogen floor lamp for Flos. The Australian's Helice is 74 inches tall and provides indirect lighting via a 300-watt halogen lamp. Finishes include: silver body with a blue color accent; anthracite gray body with yellow accent; and gold with a green accent.
Circle 108 on reader service card

Structural Wood Panels Guide

The American Plywood Association (APA) of Washington has published a revised edition of the *APA Product Guide: Performance Rated Panels*. It includes descriptions of different types of structural wood panels that conform to performance-based standards. Performance rating and span testing are among the topics discussed.
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Leftover Paint, Recycled and Reused

According to the Green Paint Company, there are three to five gallons of leftover paint in most U.S. households. To make use of the leftovers, the manufacturer collects and processes unused paints and stains to produce new products made of 15 or 90 percent post-consumer waste.The line includes urethane-reinforced alkyd floor enamel; exterior oil-based primer; solid exterior oil stain; exterior latex house paint; interior latex eggshell finish; and interior latex flat finish; colors are currently limited to a handful. *Environmental Building News* reports that the products have been well received in the field.
Circle 109 on reader service card

Environmental Impact of Foam Insulation Reduced

The Dow Chemical Company, manufacturer of rigid foam insulation for commercial and industrial applications, has announced a new generation of its Trymer™ family of high performance, polyisocyanurate foam insulation. The new foams are manufactured with HCFC 141b, a blowing agent with "approximately 90 percent less ozone-depletion potential than the standard CFC blowing agent" used in the original Trymer insulation. The foams are suitable for a variety of applications.
Circle 110 on reader service card

Computer Products News

Drawing, Document Software in Windows Version

ACS Telecom's drawing, document, and image management software, AutoEDMS, is now available in a Windows version. The new version allows users to find, store, manage, retrieve, and print automatically "virtually any drawing, document, or image." It can manage multiple Windows programs simultaneously, create a system that tracks documents and information to meet ISO 9000 requirements, and enable users to design database screens and fields graphically with a screen painter and database fields.
Circle 111 on reader service card

Document Management Software

Now available in version 3.1 for Windows is Cyco Software's AutoManager® Workflow, a document management system with file viewing capabilities for management of documents and technical data originally designed to manage CAD drawings. The new version manages all document types used in most design work. In addition to AutoCAD files, it also supports Generic CADD and MicroStation files, and raster and text file formats. Featuring a local "document server," version 3.1 actively manages and tracks documents created in AutoCAD and other Windows applications.
Circle 112 on reader service card

Revised Lighting Software

Lighting Technologies has released version 6.0 of Lumen-Micro, a lighting analysis software. The new version has all of the capabilities of earlier releases plus a CAD interface, more extensive computational capabilities, a flexible photometric file editor, support for SuperVGA renderings, and automated walkthroughs.
Circle 113 on reader service card

Rendering Inside AutoCAD

The new version of Big D Rendering Software from Graphics Software runs inside AutoCAD Release 12 so that users no longer need to write DXF files and exit AutoCAD to create ray-traced renderings. In Big D Release 7, an ADS application, all rendering options, lights, and finishes are defined using AutoCAD dialog boxes. It reads entities directly from the drawing database and renders the image to the selected AutoCAD viewpoint.
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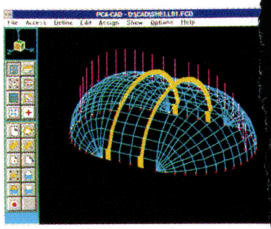

Graphical Model Generator for Concrete Structures

PCA-CAD is a new graphical model generator designed for use with PCA-Frame, a program for three-dimensional static analysis of concrete structures offered by the Portland Cement Association. PCA-CAD provides rapid drawing of structural models for PCA-Frame directly on the screen. Copying, extrusion, and mirroring with variable offsets and rotations enable fast modeling of complex structures. The generator also applies member and joint properties, loads, and other assignments graphically. The PCA-Frame/PCA-CAD package is written for the Windows V3.x environment.
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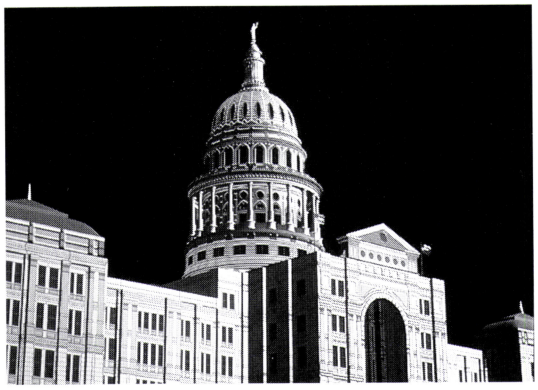

Still-Rendering in DOS and Windows

Autodesk has released Windows and DOS versions of its AutoVision™ software, a still-rendering application with photo-realistic image quality that operates within AutoCAD Release 12. Both the DOS and Windows versions, AutoCAD Development System™ applications from the company's Multimedia Division, enable easy migration from still-rendering to broadcast-quality animation through Autodesk 3D Studio Release 3. AutoVision™ software allows users to render multiple views of a drawing, each with different lighting, materials, and surfaces.
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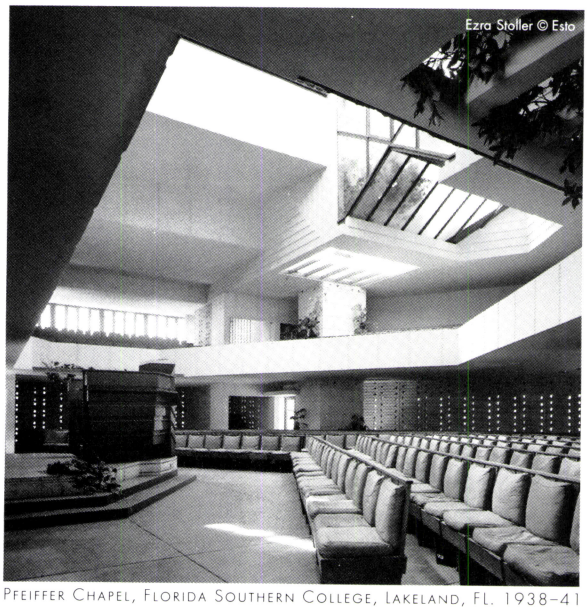
MAY COME INSIDE,
AND THE INSIDE
MAY, AND DOES,
GO OUTSIDE.



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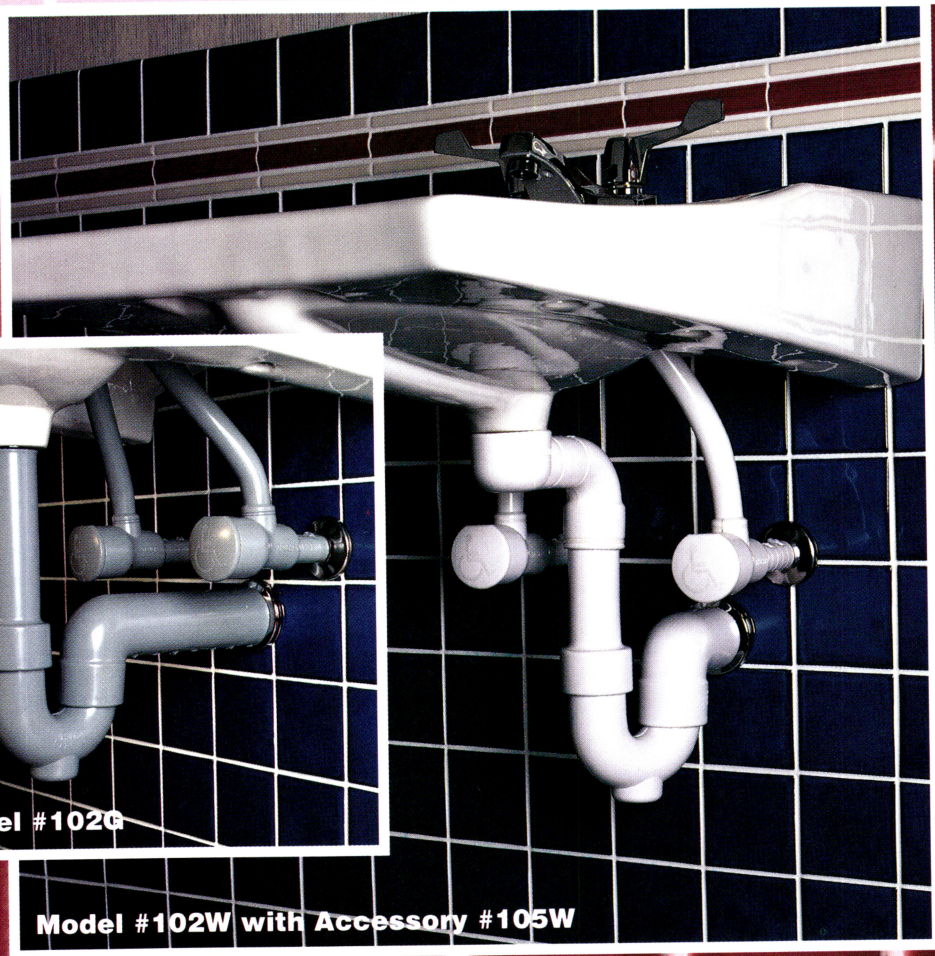

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1st Annual P/A Awards for Architectural Research

Progressive Architecture announces its first annual P/A Awards Program for Architectural Research, in collaboration with the AIA/ACSA Council on Architectural Research. The Council is composed of a balance of practitioners and academics. It advocates and disseminates research that supports the design and construction of inspiring buildings and sustainable communities. The purpose of this awards competition is to recognize outstanding research in architecture and urban design, and to help disseminate it for use by the profession.

Awards and citations will be designated by a jury drawn from the Board of the Council on Architectural Research and leading researchers in the field, and will be ratified by the entire Council Board. Decisions will be based on the overall excellence, innovation, and rigor of the study, as well as its usefulness to the practice of architecture and urban design. The jury will consider the degree to which the research addresses compelling social needs, extends traditional architectural expertise, demonstrates ways to integrate research and design, or utilizes multidisciplinary problem solving. Research methodology appropriate to the nature of the inquiry should be made explicit, as should the application or applicability of the research.

Entrants will be judged in one of three broad categories of research: Energy and Sustainable Design, Behavioral and Social Science, or Technology and Materials. Entrants are urged to interpret the call for outstanding research as broadly as possible to include the diverse subdisciplines of architects as well as diverse modes of inquiry.

Deadline for Submissions: March 18, 1994

Judging will take place in April 1994 and winners will be notified confdentially. Public announcement of the winners will be made in July 1994 and winning entries will be featured in the July issue of P/A. Clients and supporters of the research, as well as the researchers, will be recognized. P/A and the Council will distribute information on winning entries to national, local, and specialized media.

Jury

Sharon Sutton, AIA, Ph.D.,
Chair, Associate Professor of
Architecture and Urban Planning
The University of Michigan
Ann Arbor, Michigan

Randolph R. Croxton, AIA
Croxton Collaborative, Architects
New York, New York

Jay Farbstein, AIA, Ph.D.
Jay Farbstein & Associates
San Luis Obispo, California

Donald Watson, FAIA
Dean, Professor of Architecture
Rensselaer Polytechnic Institute
Troy, New York

Julia Robinson, AIA
Professor of Architecture
University of Minnesota
Minneapolis, Minnesota

Invited experts in the three research categories, to be announced.

(rules and entry form on following page)

P/A Research Awards Program

Entry form Please fill out all parts and submit, intact, with each entry (see paragraph 9 of instructions). Copies of this form may be used.

Entrant:
Address:

Credit(s) for publication (attach additional sheet if necessary):

Entrant phone number:
Project:
Client/Funding Agency:
Phone number:
Category:

Entrant:
Address:

Project:
I certify that the submitted research was done by the parties credited and meets all Eligibility Requirements. I understand that any entry that fails to meet Submission Requirements may be disqualified. Signer must be authorized to represent those credited.

Signature

Name (typed or printed):

Fees: $100 per entry

Research Awards Editor/Progressive Architecture
600 Summer Street, P.O. Box 1361, Stamford, CT 06904
Project:
Your submission has been received and assigned number

Entrant:
Address:

(Receipt:)

Research Awards Editor/Progressive Architecture
600 Summer Street, P.O. Box 1361, Stamford, CT 06904

Entrant:
Address:

(Return label)

Eligibility

1 Who Can Enter: Architects, environmental design professionals, and academics conducting research and working in the U.S., Mexico, or Canada may enter one or more submissions. Research may be focused on any location, but the study must have been directed and substantially executed in the U.S., Mexico, or Canada not more than five years ago.

2 Substantive Projects: Entries may include only funded research, reports accepted by clients for implementation, or studies undertaken by entrants who have marketed or applied their results. Basis of eligibility as well as the date of the study should be explained in the submission. P/A may contact any of the parties involved to verify eligibility.

Publication Agreement

3 Providing Additional Materials: If the submission should win, the entrant agrees to make available further information and graphic materiai as needed by P/A .

4 Publication: P/A is granted the first opportunity among U.S. architecture magazines for publication of the study. However, prior publication does not affect eligibility. The Council reserves the right to publish entries that are not premiated and published by P/A .

Submission Requirements

5 Project Facts Page: To assure clear communication to the jury, each entry must contain a page that lists, in English, the research project facts under the following headings: Project Title; Research Category; Source of Funding; Total Budget; Start and Finish Date; Name and Location of Client; Research Setting; Form of Final Products; Basis of Eligibility; Bibliographic References. Ten copies of this page must be submitted.

6 Narrative: Entries must contain a three-to-five-page synopsis of the project that includes the following section headings: Purpose/ Objectives of the Project; Research Design and Methods Used in Research; Data and Analysis Procedures; Major Findings and Results; Significance and Uses of Results. Eight copies of the Narrative must be submitted.

7 Additional Materials: One copy of supplementary graphic or written material may be submitted in 8 ½" by 11" format, and all these materials must be firmly bound in binders. No slides, original drawings, video tapes, or unbound materials will be reviewed.

8 Anonymity: To maintain anonymity in judging, no names of entrants or collaborating parties may appear on any part of the submission, except on entry forms. Credits may be concealed by tape or any simple means.

9 Entry Forms: Each submission must be accompanied by a signed entry form, to be found on this page. Reproductions of the form are acceptable. Fill out the entry form and insert it, intact, into an unsealed envelope labeled "Entry Form"

10 Entry Fees: Entry fees must accompany each submission. Fee is $100. Make check or money order payable to Progressive Architecture. Canadian and Mexican entrants must send drafts in U.S. dollars. Fee must be inserted in unsealed envelope with entry form (see 9 above).

11 Entry Receipts: P/A will send a receipt by April 1, which will indicate an entry number to save for your reference.

12 Return of Entries: Entrants wishing return of submission materials should include a self-addressed, stamped envelope. Copies of Project Facts and Narrative may not be returned.

13 Entry Deadline: Deadline for sending entries is March 18, 1994. All entries must show some date marking as evidence of being in the carrier's hands by March 18. Hand-delivered entries must arrive at P/A's offices (address below, 6th Floor reception desk) by 5 p.m., March 18. In order to assure arrival in time for the jury, P/A recommends using a carrier that guarantees delivery within a few days.

Address Entries to:
P/A Awards Program for Architectural Research
Progressive Architecture
P.O. Box 1361
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Stamford, CT 06904
(For carriers other than mail, delete P.O. Box)

Deadline: March 18 Strictly Enforced

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New Louvre Wing *(continued from page 17)*

engineered system of aluminum slats, barely perceptible beneath the glass, regulates the light spilling from the variable Paris skies.

Pei's adroitness at reorganizing the Louvre's overall circulation is made even more evident with completion of the Richelieu wing. Now, the vast subterranean entrance hall below the central pyramid serves fully as intended: one sees from a single vantage point exactly what is where. Along the Richelieu wing's southern edge, a giant tier of escalators runs up through three floors, enhancing the place's spirit of openness and providing an unusual kinetic experience.

Urban Contribution

From an urban standpoint, the completed wing reveals and restores deserving primacy to the Passage Richelieu, a pedestrian arcade that is now the main link between right-bank Paris and the Cour Napoléon, where pedestrians enter the museum beneath Pei's pyramids.

Through large glazed openings that flank the covered passage, passersby have enticing views into the luminous, always lively Puget and Marly courtyards. This adds a fine new experience to Paris's rich repertoire of walks, with the advantage that one need not actually enter the museum to enjoy it. If the passage's big glass openings seem oddly proportioned and too large when seen from within the courtyards, the tradeoff still seems worthwhile.

Fighting Fatigue

French reporters on hand for the Richelieu wing opening seemed preoccupied to know whether – with 60,000 square meters of space and 30,000 objects on display – the Louvre had now become the world's largest art museum. "Maybe," said a curator, noting that Russia's Hermitage and New York's Metropolitan are also contenders; it depends on what one measures. But he was happy to say, without fear of contradiction, that – with five million visitors last year and probably more this year – the Louvre remains first in gate among the world's art museums.

But Pei offered a different view: "It is a mistake to see success of a museum in terms of how many people visit it, or how large it is. More important is how long people stay, and the quality of their experience," Pei said, predicting that with new facilities for visitors "to restore, refresh, and rest themselves," lengths of stay would rise markedly.

It does seem likely that the newly opened parts of the Louvre will do much to relieve museum fatigue, but this comes at a price. Simultaneously with the unveiling of the Richelieu wing, below Pei's new "inverted pyramid," the Louvre has opened a phalanx of fast-food outlets and a large subterranean commercial shopping mall. These areas are all quite handsome and are well separated from the art collections and museum areas.

But the new facilities they house are deliberate tourist traps, and some of them approach crassness, despite the government's insistence that the Louvre exercises "tight cultural quality control" and does not allow "just anybody" to sell there (leading one to conclude that even soap and tie shop franchises have important cultural dimensions). *(continued on next page)*

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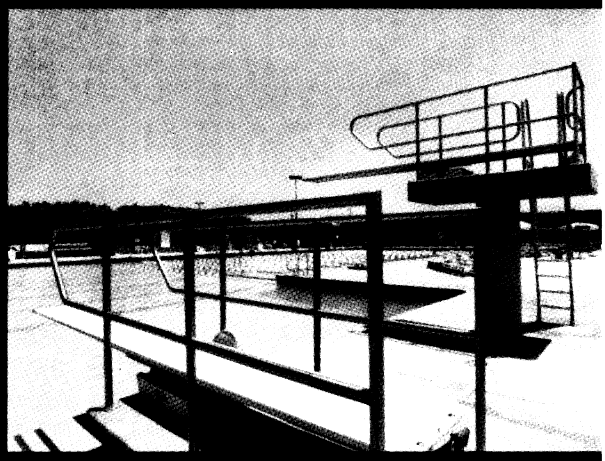

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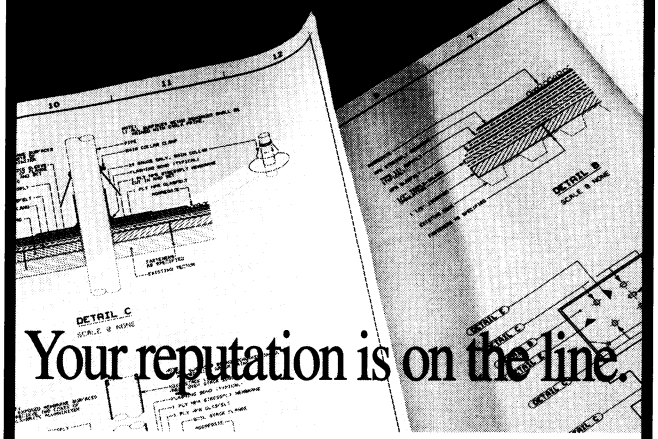

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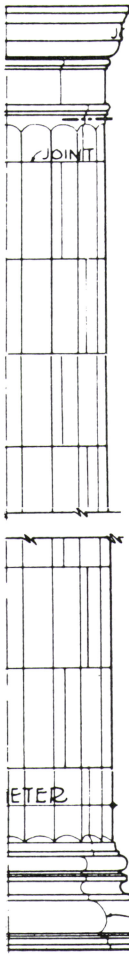

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News

New Louvre Wing *(continued from previous page)*

This part of the complex, fed to overflowing by a new Metro link and an underground bus-park disgorging thousands of visitors, can be fatiguing in a different way. It is true that, as one observer noted, street vendors and shops selling cheap souvenirs have long surrounded the Louvre. But on busy days, The new hubbub can almost make one miss the old Louvre, without the commercial trappings of big-time cultural tourism. ■

Quaternario Awards *(continued from page 19)*

Foster. The Singapore architect focused on work being done in the formulation of planning principles for the sustainable tropical city. Chief among the policies of Singapore's Tropical City Concept were reurbanization in lieu of expansion; the development of linear, two-level civic and community spaces linking high-density mixed-use "nodes"; a reduction of the reliance on artificial cooling by providing more high-level shading and by introducing vertical greenery on the surfaces of buildings, which could cut down heat absorption and increase radiant and evaporative cooling.

Foster, too, addressed sustainability in his presentation. Much of his discussion of recent projects, such as the Business Promotion Centre in Duisberg , Germany (see article on curtain walls, p. 76), centered around the development of more efficient energy economies as an integral part of the buildings' design. Implicit in Foster's positioning of his practice is the pooling of expertise under the aegis of the architect.

Yet environmental concern did not seem to be the most salient characteristic of the award-winning projects, but rather structural invention figured as the major criterion in their selection. Grimshaw's Waterloo Terminal is remarkable for the complexity and finesse of its customized building components, minutely detailed and modeled in the architect's office for subsequent manufacture; Maki's convention center (P/A, Aug. 1990, p. 74) is impressive for the ingenuity of its hybrid "space beams," combining the characteristics of truss and space frame to support the vast roofs. L'Oréal's factory by Valode et Pistre is distinguished by a seductively undulating "three-petal" roof, engineered by Peter Rice as a thin aluminum and polyethylene skin, supported by a delicate system of inverted steel pyramids, cables, and thin bars. Behnisch's parliament building is notable for an unusual design *parti* that called for wrapping the skylighted plenary hall with layers of transparent walls allowing views of the Rheinland landscape. Forbes & Fitzhardinge's winning R&D complex in Australia is commendable mainly for its sensitive and sensible siting, which places well-serviced laboratory buildings in pinwheel fashion around a central hub and allows for their future expansion with minimal disruption.

Yet, however deserving the winning projects, it appears from a survey of 30-odd projects presented at Quaternario that a broad spectrum of technological challenges – sustainability in particu lar – are too seldom addressed. In the absence of widespread interdisciplinary pooling of expertise, a greater part of the profession's creative energies will continue to be expended primarily on structural feats. ■

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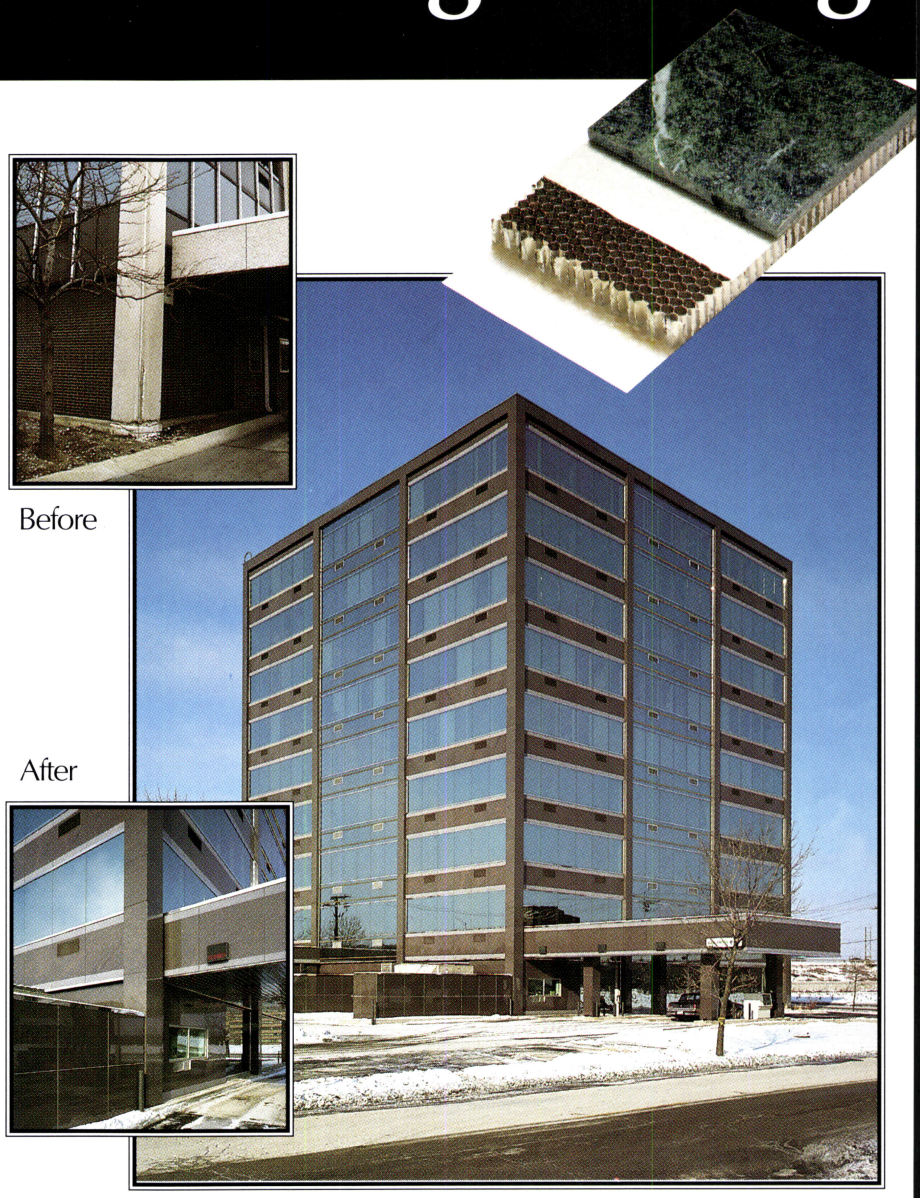

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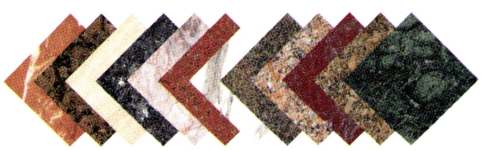

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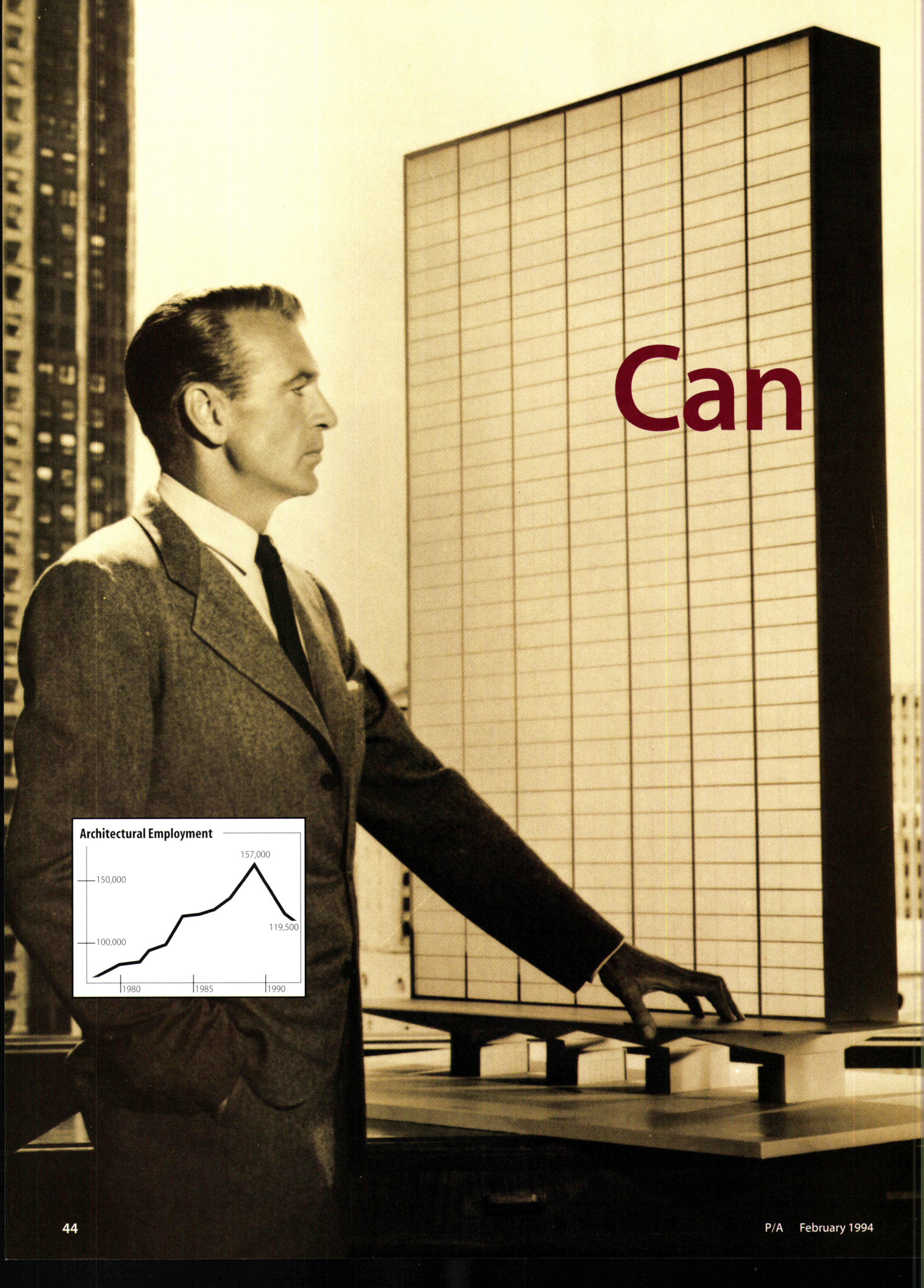
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Architectural Employment
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This Profession Be Saved?

Architects generally agree that this profession faces profound problems. Do other professions provide models for solutions? ***by Thomas Fisher***

There is one question that everyone seems to be asking right now: Where is the profession headed? The question is significant for a couple of reasons. Even to ask it assumes that the profession is changing and that the old ways of doing things no longer work – a momentous assumption given the amount we invest in training and licensing people to engage in traditional forms of practice. At the same time, the question implies that the profession is moving in a single direction and that, with enough effort, we will be able to define forms of practice in the future as clearly as we have in the past.

Having spent months talking to many people in this field, I think it is clear that the profession is undergoing tremendous change. But it is changing in a lot of different directions at once, suggesting that the profession in the future will be more diverse and more fragmented than in the past.

The Effect of the Recession

At issue here is how much the problems facing the profession – high rates of unemployment and underemployment, intense competition for work, stagnant or declining incomes – stem from the recent recession or from more fundamental, longer-term shifts in the demand for architectural services. The impact of the recession is indisputable. Since 1989, nonresidential construction has declined by 31 percent and architectural employment by 24 percent. But many in the profession are beginning to ask whether the recession only accelerated other forces that are permanently altering the profession's position and power.

The Rise in Productivity

One such force is the computer and its telecommunications cousins, the modem and the fax, which have increased

"Today aesthetics is seen as marginal and even somewhat superfluous."

the productivity and profitability of firms fully utilizing the technology (P/A, September 1993, p. 66). But computerization has permanently eliminated certain types of jobs, particularly the entry-level drafting jobs that architecture schools have depended on to complete the technical training of their graduates.

It also has eliminated the barriers of time and distance that once protected firms from competition. More and more architects must now compete with colleagues who, with a CAD system in a spare bedroom, can produce drawings on time for lower fees. Architects must also vie for work with distant firms who can deliver services as effectively as the local offices. As Frank Stasiowski of Practice Management Associates points out, "By the year 2000, any two-person design firm can do work anywhere."

The Eroding Client Base

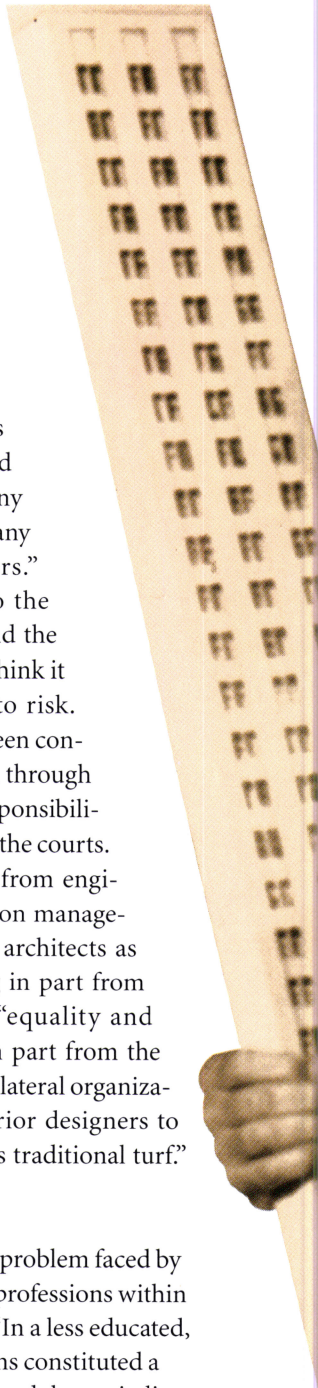
A second long-term factor affecting the profession has been a shift in the supply and demand of architectural services. Sharon Sutton of the University of Michigan argues (P/A, October 1993, p. 76) that some of the profession's problems stem from an oversupply of architects, "whose ranks swelled eight times in a population that only doubled" since 1920. Sutton also argues that there has been a decline in demand for architectural services as our economy has shifted from one dominated by many independent landowners, who often turned to architects, to one dominated by fewer large corporations and a lot of salaried employees, who rarely use architects.

Paralleling that economic shift has been an apparent decline in the public's perception of the architect's value. "As America moved from an industrial economy to a service economy," notes lawyer Carl Sapers, "architects who once commanded knowledge of both mechanics and aesthetics no longer were in command of mechanics." At the same time, knowledge of aesthetics was devalued. Architect Stanley Mathews, in an unpublished manuscript, has traced how "the profession has historically sought – and continues to seek – legitimacy in an aesthetic paradigm that has neither the credibility nor the authority it once possessed. A century ago aesthetics were a legitimate and respected concern within the public consciousness and indeed provided a secure foundation on which to base the architectural profession ... while [today] aesthetics are seen as marginal and even somewhat superfluous."

The Loss of Professional Turf

Another force affecting the long-term prospects of architects has been a shift in the architect's role in the building team. "Once," observes architect Elizabeth Padjen, "the practice of design was a subtractive process in which the architect was in charge of the whole ball of wax, peeling off pieces to give to consultants and contractors. Now it is additive, and the architect's role is only one of many small bits assembled along the way by any number of construction coordinators." Padjen attributes that shift in role to the growing complexity of construction and the changing nature of client groups, but I think it also stems from architects' aversion to risk. Over the last several decades, we have been content to shrink our duties, sloughing off, through revisions to the standard contracts, responsibilities for which we might be held liable by the courts.

Meanwhile, a variety of disciplines from engineering to interior design to construction management are increasingly competing with architects as equals. Carl Sapers sees this stemming in part from the tendency of architects to favor "equality and peaceful resolution" of conflict, and in part from the AIA's entering "into agreements with collateral organizations representing engineers and interior designers to allow them to trespass on the architect's traditional turf."



The Waning of Professionalism

Perhaps the most difficult long-term problem faced by architects is a growing skepticism of all professions within the general public. As Sapers observes, "In a less educated, more class-ridden society, the professions constituted a middle force between the working class and the capitalist class." But "that special role of the professional has all but disappeared .... The rising tide of education in society and the destruction of a class-based society empowered more people to challenge the professional's judgment." Aiding that challenge are electronic databases and expert systems, which make it increasingly difficult for professions to control infor-

Education

"How is it that we are allowing more and more people to come into architecture schools in the nominal pretense that they will become architects in the old style? ... Not everyone comes out of the other end of the machine. But those many who do emerge in a marketplace which isn't at all the kind of space they expected it to be ... their status is low, their chances at designing something satisfying are slim, and their earnings stand scant prospect of being commensurate with the length of this training.

Schools of architecture have always stood a little apart from the everyday demands of the profession and of the marketplace, and it is right that that should be so. But how far can that divergence go before the link between the school and the profession becomes dangerously tenuous, and the implicit guarantee that the school prepares the student for the world of work verges on dishonesty?"

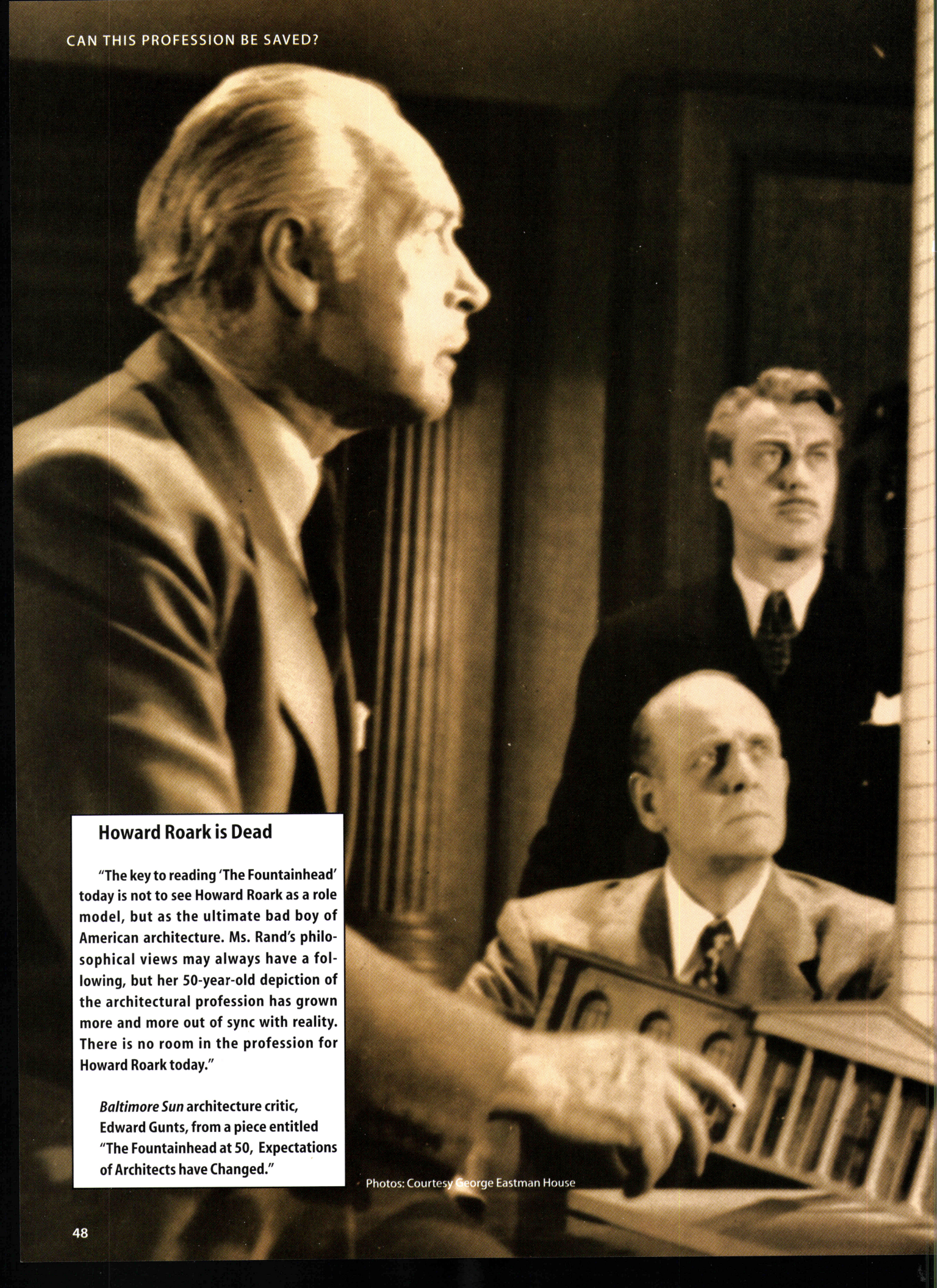
Historian Andrew Saint, from a paper delivered at the Harvard Graduate School of Design, October 23, 1993.

mation and protect their knowledge through licensing.

Architects are particularly vulnerable to such skepticism, partly because, as Sharon Sutton notes, architecture "has not become a specialized, knowledge-based field comparable to law ... medicine ... (or) engineering," and partly because as British historian Andrew Saint observes, architects "are from the public point of view rarefied and elusive creatures."

I would add a third factor: the profession's loss of a clear public purpose. Although a recent AIA poll showed that architects, as Saint puts it, "are rather less disliked than other professions," we are too often seen, particularly since the 1980s, to be promoting the interests of wealthy clients – fat-cat developers, big corporations, rich institutions or individuals – over those of the general public.

And what happens when a profession loses the public's trust? Look at England right now, where there was recently a move in Parliament, based on the recommendations of the Warne Report, to deregulate architecture and no longer protect the architect's title. "John Warne," says Saint, "argues that there is no convincing evidence that pro-



Howard Roark is Dead

"The key to reading 'The Fountainhead' today is not to see Howard Roark as a role model, but as the ultimate bad boy of American architecture. Ms. Rand's philosophical views may always have a following, but her 50-year-old depiction of the architectural profession has grown more and more out of sync with reality. There is no room in the profession for Howard Roark today."

Baltimore Sun architecture critic, Edward Gunts, from a piece entitled "The Fountainhead at 50, Expectations of Architects have Changed."

Photos: Courtesy George Eastman House

"One way to answer that question is to look to the professions of medicine, law and engineering, which have faced problems similar to our own"

tecting the title 'architect' has ever done either the public or the profession any good."

Three Models of Action

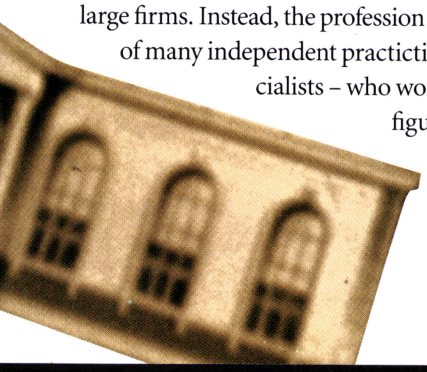
How should the profession respond to its predicament? One way to answer that question is to look to the professions of medicine, law, and engineering, which have faced problems similar to our own. None of these professions holds all of the answers, but I think we can learn something from each one.

The Medical Model

In the last century, the organization of the medical profession was not unlike that of the architectural profession today. It was composed largely of general practitioners who, with little technology and a scant knowledge base, attempted to handle patients' every need, from dispensing cold medicine to delivering babies to removing tonsils. Earlier in this century, however, the medical community began to reorganize itself, turning the general practitioner into a kind of coordinator of highly paid specialists, to whom patients with particular needs are referred. What that reorganization accomplished, among other things, was to maintain close and frequent contact between doctor and patient, while promoting highly paid specialists who would make available to people the benefits of current research.

The architectural profession's structure is now almost the opposite of medicine's, with highly paid "generalist" partners and "specialist" employees who are paid less and are largely invisible to clients. But, if this profession were reorganized along the lines of the medical field, what would happen?

Some architects would serve as general practitioners, primarily diagnosing problems with existing facilities, analyzing clients' physical space needs, and putting together teams of specialists who would offer expertise in areas such as design, technology, and management. There would probably be few, if any, large firms. Instead, the profession would consist, as in medicine, of many independent practictioners – whether GPs or specialists – who would team up in various configurations for different clients.



The architect as general practitioner would have to be more involved in building health, perhaps making periodic checkups of structures to ensure that they are in good working order and to watch for problems. Building diagnostics would be a focus of architectural activity (and architectural education), not the marginal activity that it is now. At the same time, the market for architects would be, potentially, everyone who owns a building, not just those few who want a major rehabilitation or to build anew. Likewise, specialist architects would have strong ties to research and technical developments in their areas of expertise. They would be highly visible and well-paid members of the building team, bringing to projects in-depth knowledge about particular problems and procedures.

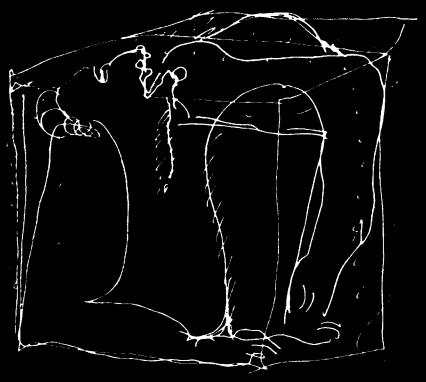
The parallels among different fields, however, go only so far, argues Princeton professor, Robert Gutman, who is engaged in a comparative study of professions. He notes, for example, that the architectural community has no institutional equivalent to the hospitals, which were key to the reorganization of medicine. Still, the architectural profession seems to have been pushed by the recession toward the medical model: witness the increase, in recent *(continued on page 84)*

Market Position

"Architects have tried to legitimize the profession ... through exclusivity and elitism. In their search for a credible professional identity, architects have systematically attempted to purify the aesthetic high ground by divesting the profession of various technical and menial roles now taken up by engineers, consultants, and builders. While serving to delineate the professional identity of the architect, the elitist relinquishment of industrial construction and middle-income housing has had the effect of diminishing and narrowing the client base available to the architect to little more than developers, large institutions, corporations, and the occasional wealthy individual. The result is that architects now find themselves in something of a self-imposed exile within design."

Architect Stanley Mathews, from a paper entitled *"Architecture, Science, and Aesthetics."*

Four projects, spanning 30 years of the production of the Norwegian architect, portray an inherently humane, site-specific Modernism regrettably scarce in the United States.



The Workings of

by Per Olaf Fjeld

Introduction

P/A's departure from the customary focus of architecture magazines on newly completed individual buildings offers a new opportunity: to disseminate *ideas* as they emerge from an architect's body of work. In this issue, we present selected projects by Sverre Fehn, with commentary by Per Olaf Fjeld, author of a monograph on Fehn; sidebars and photographs were contributed by Eric Ammondson, an American architect and photographer who recently spent four months in Norway studying Fehn's work, with assistance from the Norway-America Association.

Born in 1924, Fehn is considered one of the key figures to emerge after World War II, one of a group of "progressive" Scandinavian architects organized by Arne Korsmo in 1950, and linked to CIAM. Inspired by Aalto's "organic functionalism," its members (including Jørn Utzon and Christian Norberg-Schulz) sought alternatives to the nostalgia-ridden aesthetic engendered by fervent postwar nationalism. Working firmly within the tenets of the Modern Movement, Fehn developed an architecture with a distinct regional flavor, which grew out of his unsentimental affinity with his native landscape and from his capacity, as Norberg-Schulz puts it, to recapture "the complex quality" of vernacular log and stave construction.

Unfortunately, this kind of Modernism– personal, responsive to site, attentive to every aspect of structure – did not thrive in this country in the shadow of the International Style; for the last two decades, it has been further obscured by a succession of ever more superficial fads. In this context , Fehn's work might have particular inspirational value for American architects struggling to find an abiding contemporary voice.

Ziva Freiman

Architecture is rooted to place. There has always been a dialogue between the potential of place and architecture. The same is true between material and construction. Over time the interactions of these dialogues are translated into a vocabulary we call tradition. Today tradition is looked upon as something static; only the most gifted are able to revitalize it without sentimentality.

Sverre Fehn has taken the essence of the Nordic tradition and transformed it into a modern architectural language. Sensitive to his own heritage and at the same time international in his outlook, he interprets architectural conventions from a distance. His creative ability has produced a body of work with a clear and individual identity.

After numerous international awards, the significance and strength of Fehn's buildings is becoming more widely recognized: his work is not a popularized image architecture motivated by visualization, but rather is about the achievement of certain spatial qualities. His passion has always been directed by space identity and the specificness of place. In time, Fehn's impact on Modern Nordic architecture will be akin to that of Gunnar Asplund or Sigurd Lewerentz.

I have known Sverre Fehn for about 20 years. During this time, his creative method has hardly changed. He always starts with a personal story that he invents parallel to the project, which he later brings to the program. In the narrative lies the core of the project which in turn seeks an architectural content. It is difficult to trace the personal narrative in Fehn's built work, since it has been transformed into the space itself; it is not an architecture that makes a visual interpretation through signs and symbols. This reliance upon the intuitive makes the design process an individual act, very different from decision making that relies primarily on information and research.

An early project that clearly expresses the outcome of this creative process is the Nordic Pavilion, completed in 1962 for the Venice Biennale, where by means of a roof lattice of deep concrete beams, Fehn transfigures the Mediterranean light into a Nordic light.

Fehn's architecture is vitalized through a clear use of construction, since he accommodates each material's inherent capacity to fulfill its role in making the structure. The architect's conception of materials can best be seen within two distinct categories: those constituting a mass, such as concrete or stone, and those, such as wood, that carry in their natural state a set of dimensions or limitations. In the dialogue between materials of different categories, the precision of the joint is essential. Fehn allows the connections to express the materials' identity: the manner in which one material acts in conjunction with another generates an understanding of each. Yet the clarity of the individual part never precedes or dominates the construction as a whole. This can be clearly seen in the Hedmark Museum at Hamar. Here each material's relation to time also plays an important role: its acceptance of or resistance to the process of aging is part of the design.

Fehn's endeavors have always been directed towards giving the interior a clear spatial identity. He aims to preserve the distinction between inside and outside, never compromising spatial definition for a pleasant view. The stair, the ramp, the sliding door, and the varying resistance found in open or closed walls are all vital instruments in his spatial sequence. These devices activate his rooms, not in the sense that they overwhelm or direct, but rather they quietly tune each room for awareness and contemplation.

In Fehn's work, scale is a tracing of human dimensions, a reflection of human activity. This respect for architecture as an experiential instrument gives a sense of intimacy to his work that goes far beyond direct functional aspects, or the rote revival of tradition. ■

The author, an architect and longtime colleague of Fehn, is now dean of the Oslo School of Architecture. His monograph, Sverre Fehn: The Thought of Construction, *was published in 1984 by Rizzoli, New York.*

Hedmark Museum, Hamar

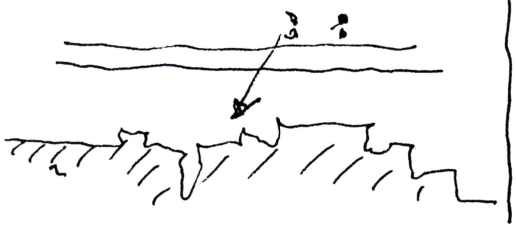
To appreciate Sverre Fehn's recent works, one must consider them within the context of the architect's best-known building, Hedmark Museum, which was completed in 1970. In this project, Fehn created a new museum directly on the ruins of a 12th-Century bishop's fortress. The board-formed concrete and laminated-wood structure stands free from the ancient stone walls, allowing archaeological excavations to continue, and forming what Fehn called a "suspended museum."

Expanding upon Le Corbusier's "architectural walk," Fehn conceived a procession that spans the centuries: visitors may ascend a ramp from the entrance up to the restored barn in the north wing, now an ethnographic museum; a raised gallery crosses over the dig sites in the central wing (left), punctuated by concrete "cells" housing medieval artifacts. From the new auditorium in the south wing, another ramp swings down and out of the building, across the former monastery courtyard.

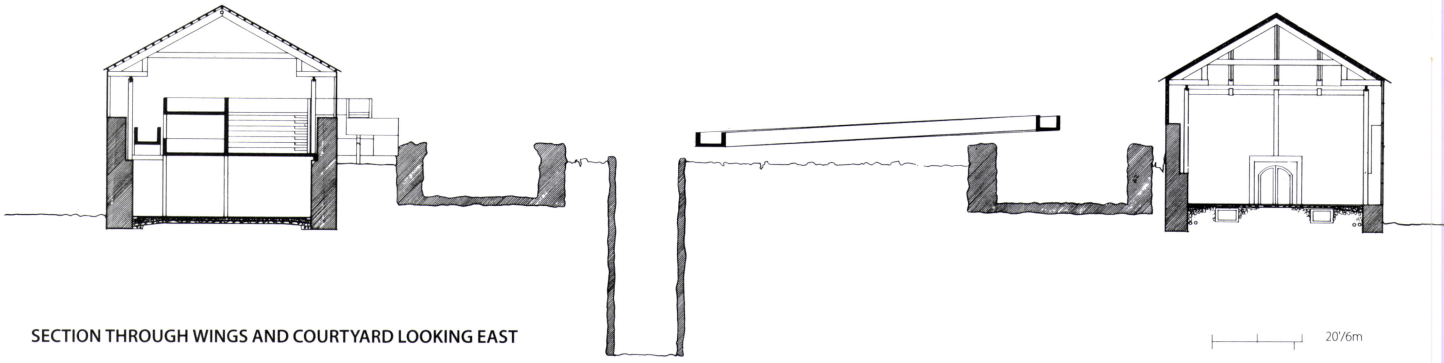
Fehn's thoughtful confrontation with the ancient building and with the archaeological objects established a dialogue between old and new construction, perhaps best expressed by the building envelope: large sheets of glass are mounted directly over the existing openings, in contrast to the timeworn masonry; new columns supporting the wood roof are placed just inside the ruin walls.

Similarly, Fehn's unflinching contemporary design of the displays sets up a communion between the handmade relics and machine-tooled forms. "Only the manifestation of the present can bring the past back to life," says the architect.

Architect: Sverre Fehn (Truls Ovrum, Jon-Kåre Schultz, Tom Wike, project team).
Engineers: Arne Negård, Terje Orlien.



SKETCH OF GALLERY ABOVE RUINS



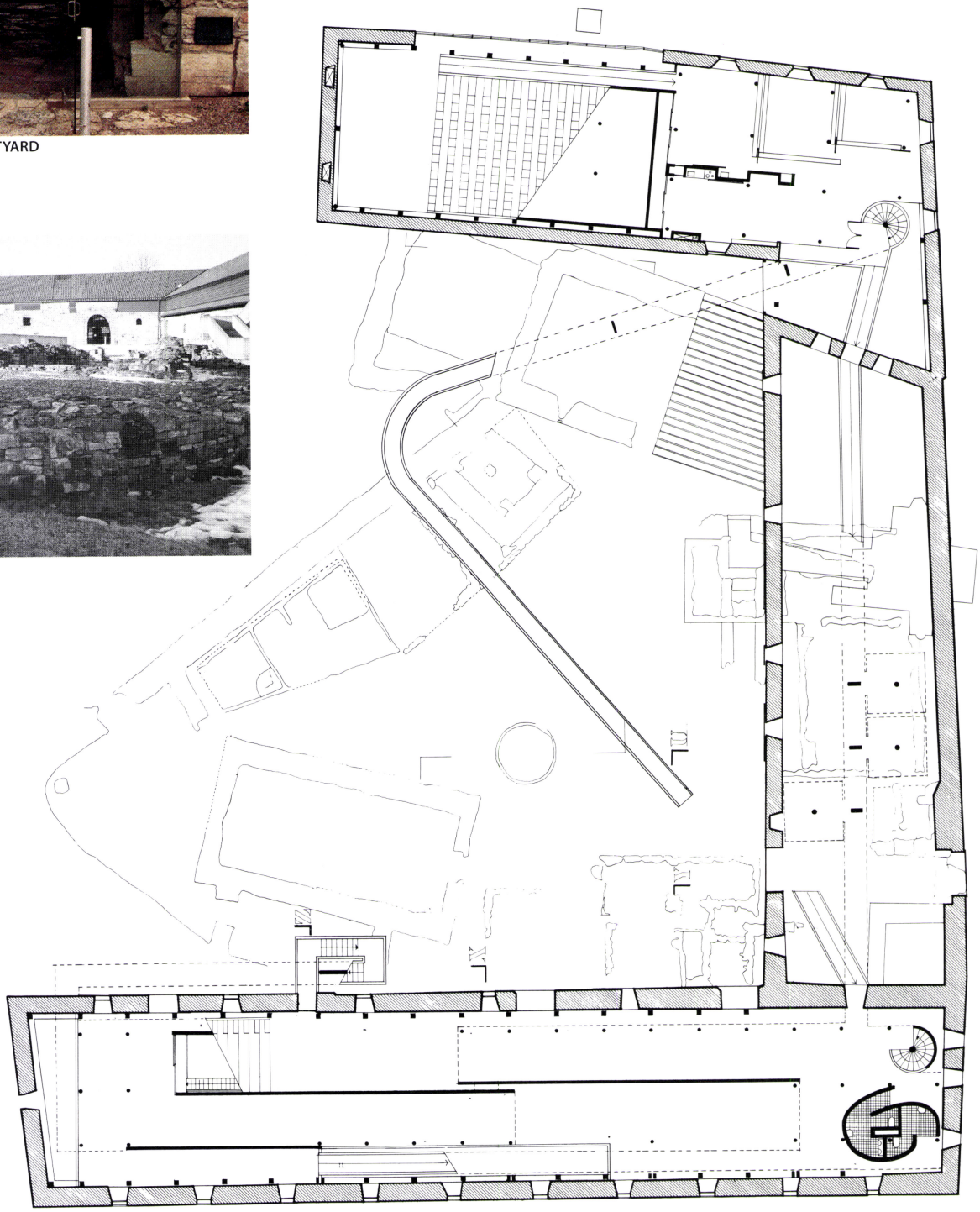
SECTION THROUGH WINGS AND COURTYARD LOOKING EAST

All building photos by Eric Ammondson

ENTRANCE WITH VIEW TO COURTYARD

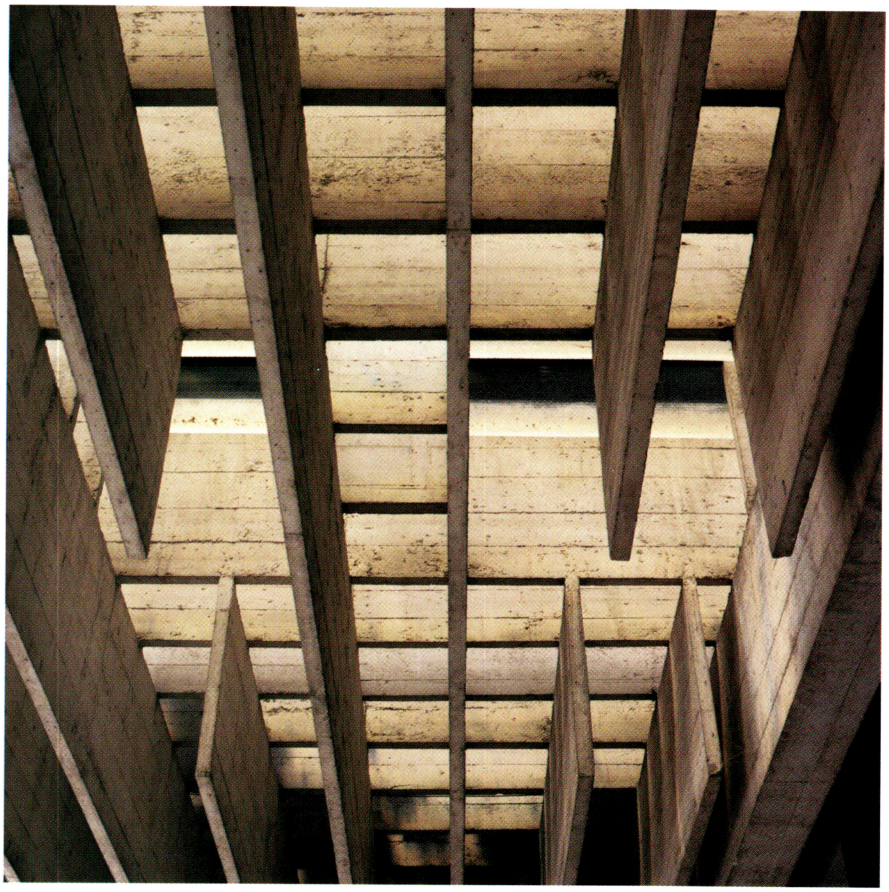
DISPLAY FOR ANCIENT BOTTLE

VIEW OF COURTYARD



SECOND FLOOR PLAN

N 20'/6m



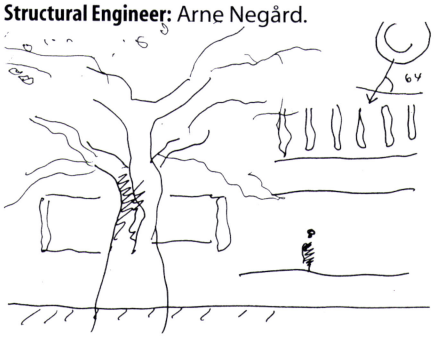
Nordic Pavilion, Venice

In 1992, Fehn's work was included in an exhibit mounted by the Museum of Finnish Architecture, entitled "Five Masters of the North." Among the projects shown was his competition-winning Nordic Pavilion, completed in 1962 for the Venice Biennale. As explained by the architect in the exhibition catalogue, the design was driven by the need to protect the artworks within from direct sunlight and by the fact that a row of trees on the site – part of the only park in the city – could not be cut down.

The pavilion is a classic example of constraints spurring ingenuity: Fehn devised a roof structure of thin concrete girders, 2 ½ inches (6-cm) wide and 3 feet (1m) deep, laid at intervals of about 1½ feet (left). One set of girders spans the width of the pavilion, a second spans its length, resulting in a 6-foot-deep *brise-soleil* pierced by the existing trees. Glass fiber profiles were hung as translucent gutters over the upper tier of girders. Light filtering in through this lattice, noted Fehn, "provided an atmosphere of the 'shadowless' world of Scandinavia."

To prevent dimming of the light's intensity, the entire building was cast in a mixture of white cement, white sand, and crushed white marble.

Architect: Sverre Fehn.
Structural Engineer: Arne Negård.



SKETCH FOR ROOF LATTICE

BIFURCATED COLUMN AND BEAM AT PAVILION ENTRANCE

PAVILION INTERIOR

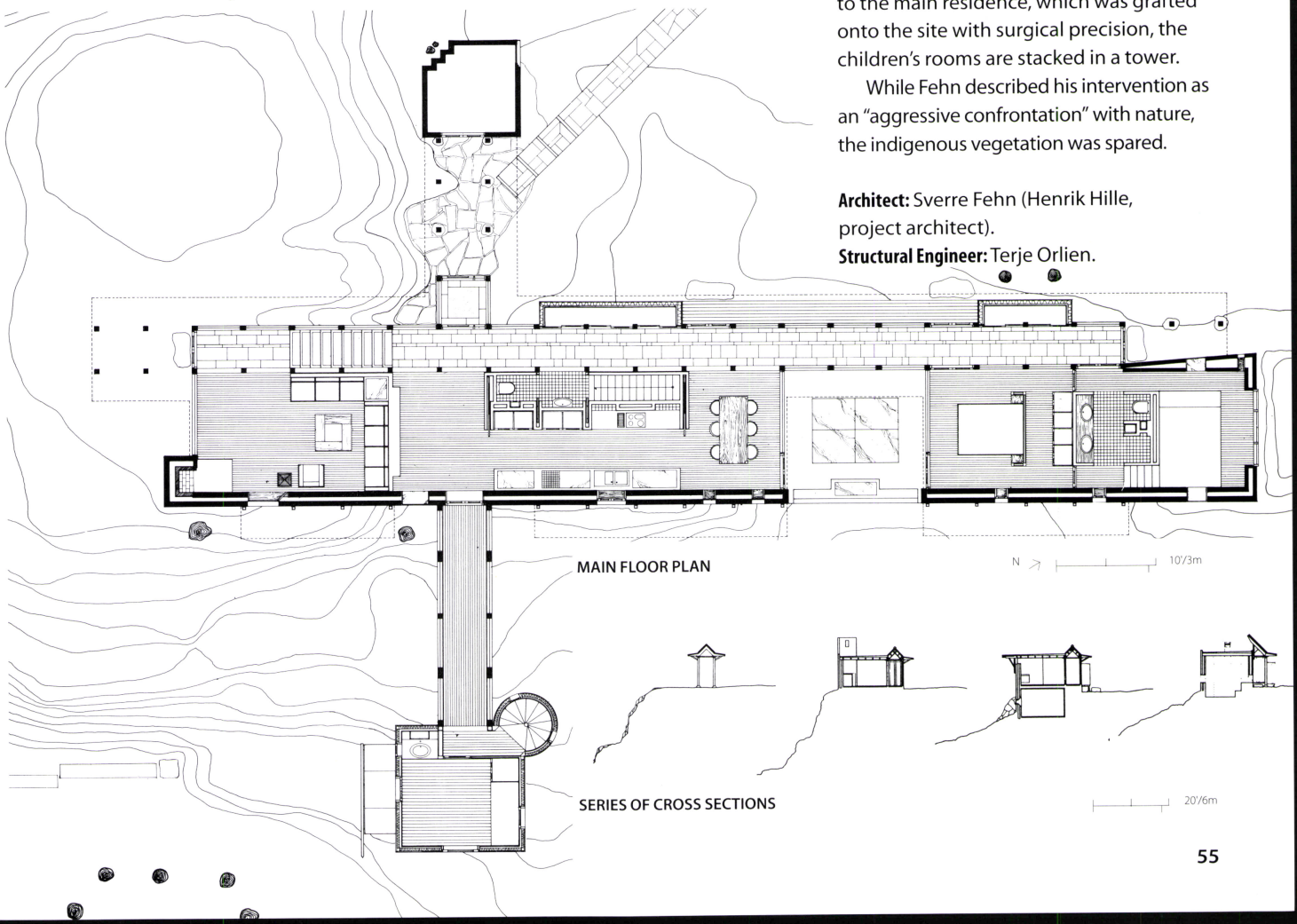
Villa Busk, Bamble

When music producer Terje Busk approached Fehn to design a house on a hillside in southern Norway, he told the architect that his family wished to experience nature while inside the house. According to Fehn, "When I build a house, I'm like an actor who is trying to invade another person's soul, to feel his spirit. In the building I show the client his self-portrait.... If he is strong he can take it."

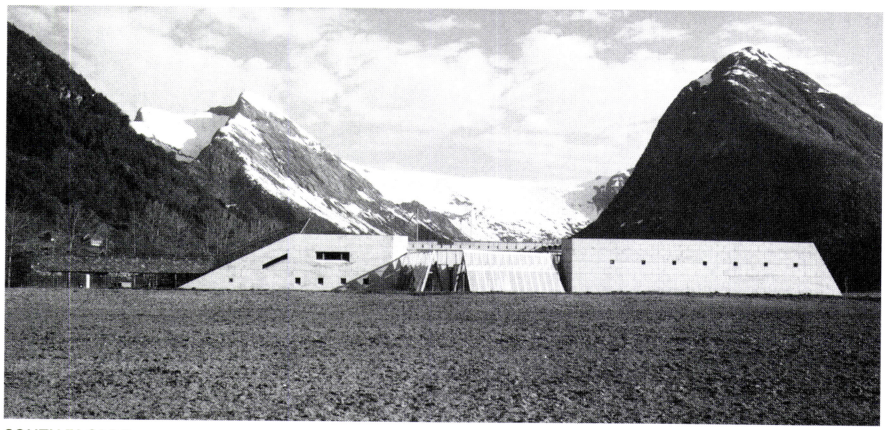
Villa Busk, completed in 1990, constitutes a powerful scenario for a family's life in the Norwegian landscape, expressed through compelling contrasts. The linear arrangement of the structure allows for disparate conditions at both extremes: the northeast end houses the parents' apartment, with a sunken pool; the opposite end holds a family room with a stone and concrete hearth. The "split character" of the building is carried through the treatments of its long façades: the north-facing entry wall is built up of transparent layers; overlooking the marshy terrain, the south façade's double-layer concrete shell is forbiddingly opaque (left). Its horizontal roof line accentuates the irregular boulders at its base, where lower-level rooms were carved out of the rock. In further contrast to the main residence, which was grafted onto the site with surgical precision, the children's rooms are stacked in a tower.

While Fehn described his intervention as an "aggressive confrontation" with nature, the indigenous vegetation was spared.

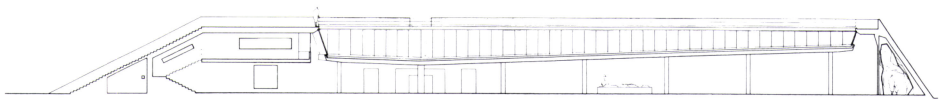
Architect: Sverre Fehn (Henrik Hille, project architect).
Structural Engineer: Terje Orlien.



Norwegian Glacier Museum, Fjærland



SOUTH FACADE



LONGITUDINAL SECTION LOOKING NORTH

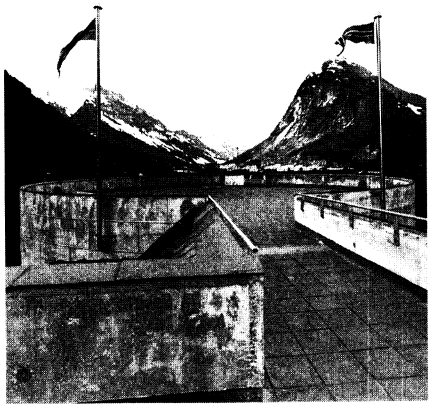
40'/12m

In western Norway, near the end of the Sognefjord, is the isolated village of Fjærland, home of the Norsk Bremuseum, completed by Fehn in 1991. As the ferry enters the fjord, there appears to be an enormous fractured boulder at the base of the mountains. Above, the Jostedals Glacier, the largest in Europe, drapes the mountains like a white mantle. Fehn has approached the site as a metaphor for the Norwegian soul itself – for in Norway, one often finds religion not in the temples built by humans, but in one's experience of nature. As seen from the ferry, ice appears to glisten on the boulder; as one approaches, the "ice" dissolves into a glass prism-like shed and the boulder emerges as the roughly formed concrete mass of the museum.

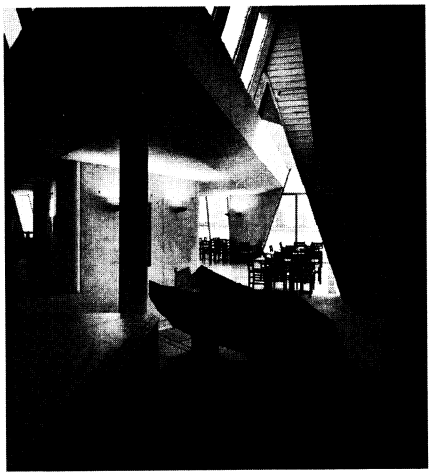
In choosing to design such an abstract, sculptural building in this landscape, Fehn again exhibits the strength he found in confronting the medieval ruins at Hamar. The passage through the museum, onto a viewing platform on the roof, and then back down, deeper into the museum, becomes a journey the architect has likened to penetrating the glacier itself to unlock the secrets within: "The atmosphere we have breathed through the centuries hides its data in the ice masses of the glacier," he noted. "Today we feel it necessary for museums to make visible the invisible." Though Fehn is hardly given to explicit symbolism, one can discern architectonic metaphors for this penetration in the fissurelike entrance, set between upthrust monumental stairs (left); in a long interior lit by a troughlike monitor running down the center of the structure; and, to an extent, in the leaning surfaces of glass and chamfered concrete forms that evoke the sheared geometry of ice.

Unlike the careful articulation of construction at Hamar and Villa Busk, in Fjærland the details are secondary to the dynamic formation of the building itelf. With mountains that tower on all sides "like gigantic walls," the architect explains, "with the plain as a plinth, the museum rises like an instrument in which visitors become the focal point in the total panorama." **Eric Ammondson** ■

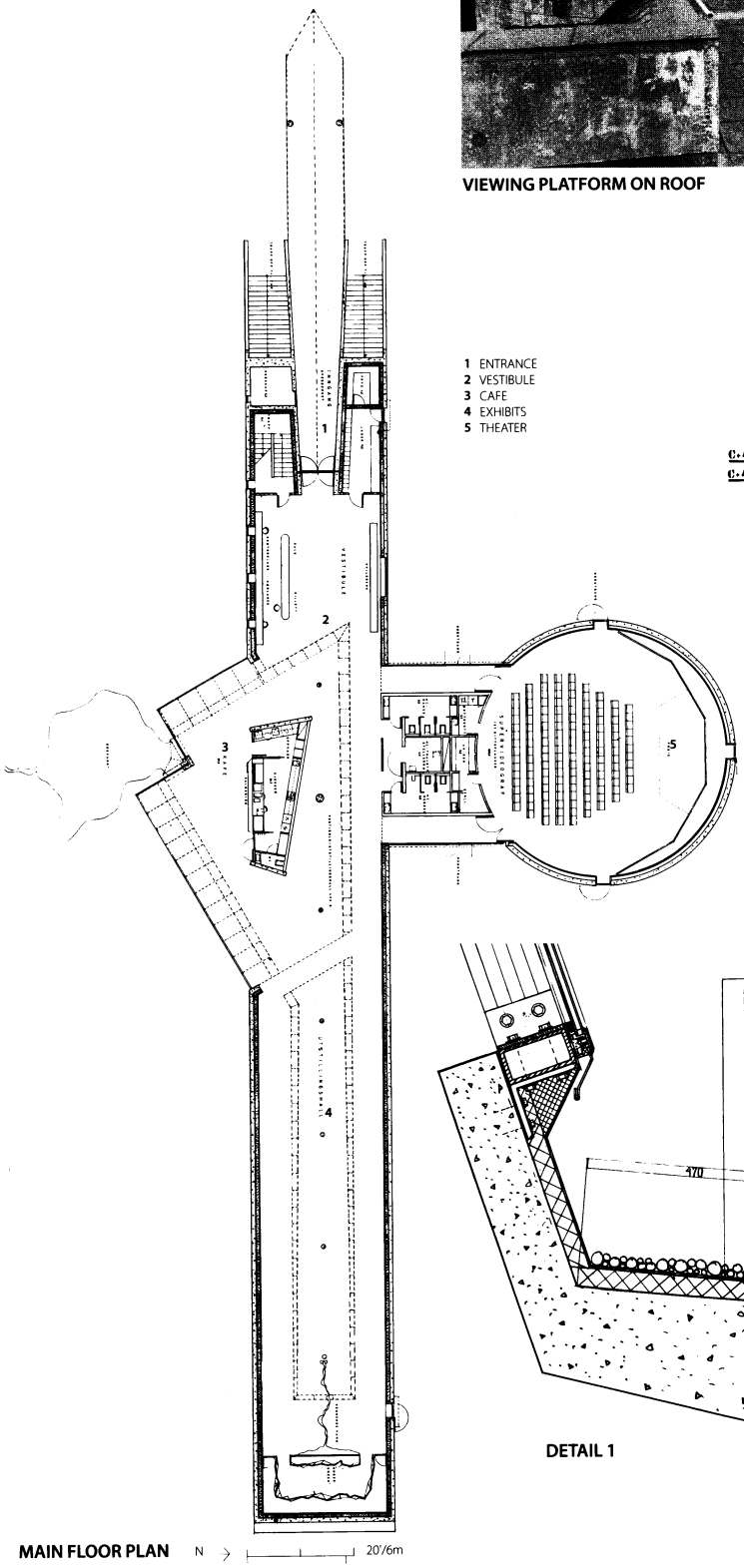
Architect: Sverre Fehn (Henrik Hille, project architect).
Structural Engineer: Terje Orlien.



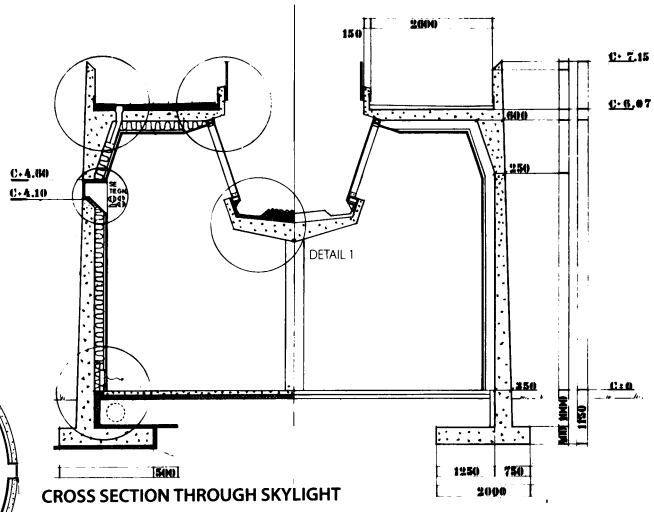
VIEWING PLATFORM ON ROOF



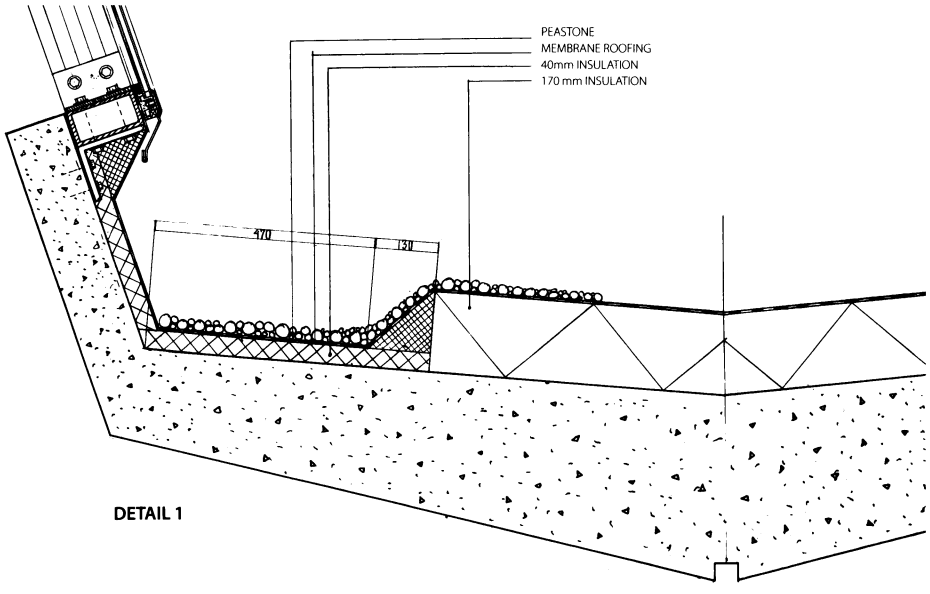
VIEW FROM VESTIBULE TO CAFE



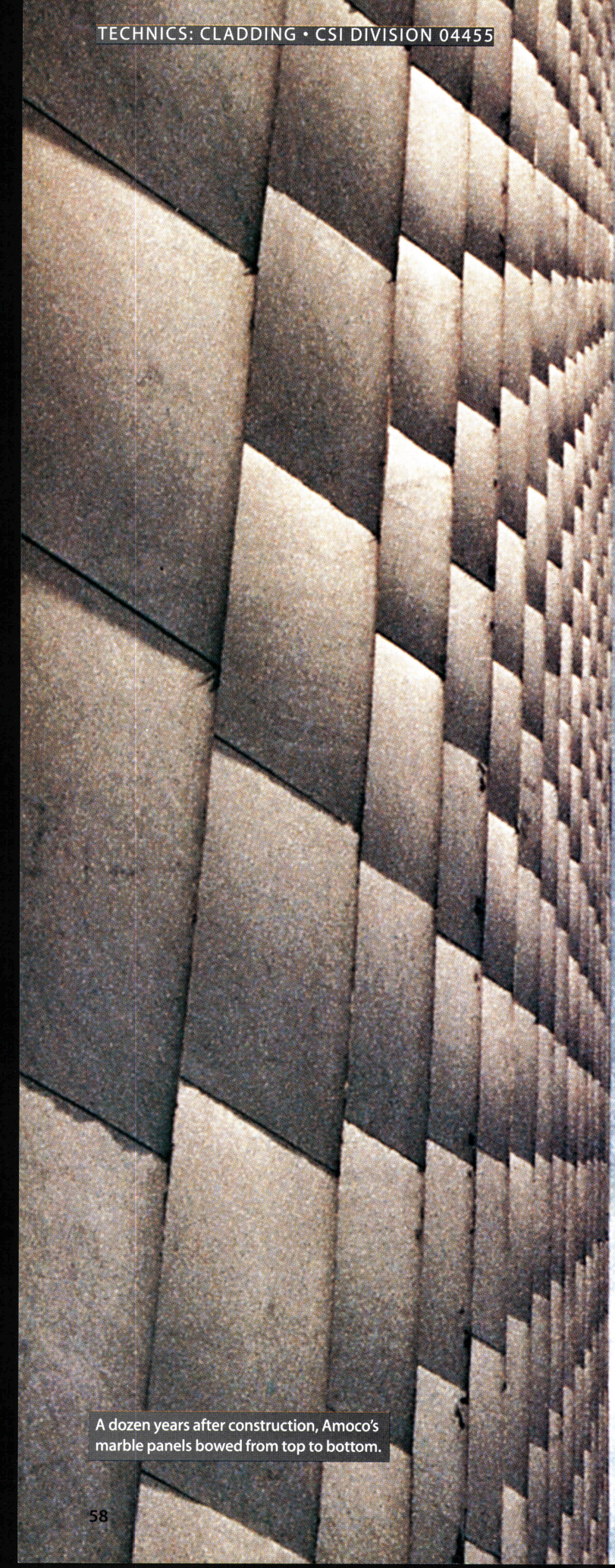
MAIN FLOOR PLAN



CROSS SECTION THROUGH SKYLIGHT



DETAIL 1



LOOK OUT BELOW!

The Amoco Building's Cladding Failure

by Gail Hook

It is the biggest recladding job in history and a wake-up call on the frailty of thin-stone veneers. A report on what went wrong at Amoco and how it was fixed.

A dozen years after construction, Amoco's marble panels bowed from top to bottom.

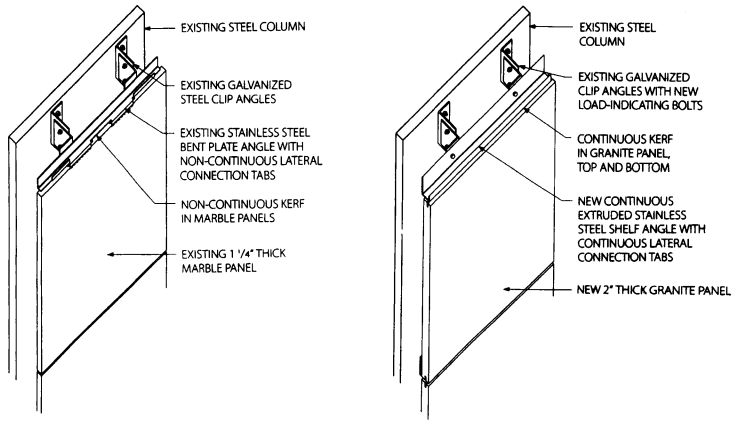
When construction materials are not properly used and detailed, problems are usually waiting to happen. When those problems are spread over the façade of an 82-story office tower, as in the case of the Amoco Building in Chicago, it is a potential disaster.

Completed in 1973, the Amoco Building was designed by Edward Durell Stone, who insisted on an all-white marble exterior. The thinly cut marble cladding panels, however, did not stand the test of time and recently had to be replaced at nearly the cost of the original building. A 1,136-foot-tall steel-frame structure with a footprint of 193 feet square, the Amoco Building is currently the fifth tallest building in the world and the tallest building that has ever been reclad.

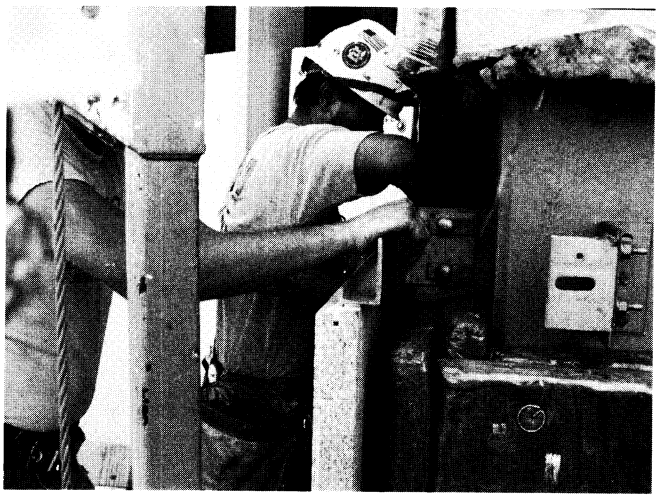
Why Did the Cladding Fail?

In 1985, Amoco took a proactive step and began periodically to inspect the cladding for deterioration, even though no problems had occurred. The façade, which was clad in1¼ -inch-thick Carrara marble panels, was inspected by Wiss, Janney, Elstner Associates, (WJE) and J. M. Logan and Associates (JML), both of Chicago. They found only slight cracking and some bowing. By 1987, however, the panels had bowed as much as 1½ inches from the original flush position, particularly on the south and east sides. As a precautionary measure, all 44,406 marble panels on the building were secured with stainless steel straps (two per panel) to hold them in place while further testing was done and a permanent solution was decided upon. Ian Chin, an engineer with WJE, says that the problem was primarily aesthetic at that time, but the bowing indicated a potential loss of strength in the panels. Chin says that the calcite crystals of marble expand and contract differently in all directions when exposed to temperature extremes like those in the Chicago area. This condition results in permanent expansion and significant reduction in strength of the marble, and can cause a thinly cut marble panel to bow. "When the sun heats up the exterior face of the marble panel, the exterior face gets hotter and expands more than the back side," says Chin. "This causes the bowing (or dishing) to occur." Accordingly, the panels on the north side didn't bow as much as those on the east, west, and south elevations, which were exposed to direct sunlight. After marble panels bow to the degree that they did at Amoco, their crystalline structure is permanently deformed and cannot return to the original shape.

Several other tall buildings in the U.S. are also experiencing problems with thin-cut stone or marble, including similar loss of strength from exposure to temperature extremes and insufficient panel connections. John Seidensticker, another WJE engineer involved in the Amoco project, cites a building in Chicago with ¾-inch-thick marble cladding that has also experienced deterioration problems. He says the strength of stone – often related to its thickness – and the safety factors in the anchorage system are critical in designing for an extended life span. Both should be structurally analyzed and extensively tested before any large-scale application of stone cladding.



ORIGINAL MARBLE PANEL NEW GRANITE PANEL



Existing clip angles were used with new load-indicating bolts to install the new granite panels.

State-of-the-Art Testing

WJE began tests to determine the strength of the Amoco building's bowed panels in 1988, which included *in situ* load testing, a laboratory accelerated weathering test developed in-house, laboratory ASTM tests, wind tunnel tests, and laboratory mock-up tests.

The tests on the marble panels revealed the following:

1. The marble had lost 40 percent of its original flexural strength because of 15 years of weathering on the building, and WJE estimated that it could lose up to a total of 60 percent. This loss was greater than the strength loss assumed by the Marble Institute of America in establishing its factor of safety.

2. The loss of flexural strength in the marble panels was directly proportional to the amount of bow the panel had experienced. In other words, the larger the bow in the panels, the greater the strength loss the panel had experienced.

3. The maximum wind force on the panels, based on wind tunnel tests, occurred at the top and upper corners of

Swing stages demarcate bright new granite below from dull old marble above. Corner hoists carried workers to and from scaffolds.

Paul Schlismann

the building and was approximately 20 percent greater than the maximum wind load presented by the Chicago Building Code. This test confirmed Chicago's code recommendation that "special investigations" such as wind tunnel tests be performed on buildings more than 600 feet tall.

Chin says that when the building was originally designed, a computer analysis of the building was done at the Massachusetts Institute of Technology, but at that time only a portion of the building could be modeled. Now a 3D computer analysis was done for the entire building in WJE's office, with programs such as SAP 90 and SAPSTL. The original tests indicated that the design met Chicago Building Codes, but technology 20 years later has revealed peak pressures, or "hot spots," on the building that were not addressed in the original codes.

Recommendations and New Design

WJE recommended that Amoco replace all of the 1¼-inch-thick marble panels with a thicker, stronger material. The engineers and Amoco evaluated numerous recladding materials, such as granite, marble, limestone, and aluminum panels, and decided to locate and use the strongest white granite available as the recladding material. After considerable testing and evaluation, it appeared that Mt. Airy granite from Mt. Airy, North Carolina, is initially stronger than marble and that it retains more of its strength over time than other stone types. A 2-inch-thick Mt. Airy granite was specified to replace the 1¼-inch-thick marble. The extra thickness was necessary to avoid loss of strength, as determined by the tests. The new design called for the installation of more than 44,000 new panels, each 4 feet 2 inches by 3 feet 9 inches, which received a 16-grit honed finish. The panels each weighed 400 pounds, which increased the total weight of the cladding by 7,710 kips (10,960 kips for the original marble versus 18,670 kips for the new granite panels). Accordingly, 20 of the building's 400 columns below grade were reinforced by welding steel reinforcement plates all around the triangular steel box columns.

John Logan, a geologist with JML, studied the Mt. Airy quarry for the areas with the strongest and most consistently white stone, and then mapped those areas to be cut. The stone was cut into panels at the quarry. Then Logan did additional testing for strength and dimensional tolerances on the panels before they were shipped by truck to Chicago, ready for installation.

Anchoring System

Although the engineers concluded that the original connection system was not related to the cladding failure, they designed, tested, and specified a stronger connection system for the new panels. The new design employed the reuse of the existing galvanized clip angles with new Lohr bolts. Lohr bolts are load-indicating; when tightened to the proper torque the nubs of the bolts pop off. The existing stainless

steel plate bent angles with noncontinuous lateral connection tabs were replaced with new continuous extruded stainless steel shelf angles, with continuous lateral connection tabs. Chin says the continuous connection is structurally superior because it provides uniform support of the stone, and stresses are not concentrated, but distributed along the entire edge. A full-scale mockup was subjected to load tests and pressure chamber tests. Chin says the anchors reflect a "simpler the better" philosophy for stone connections in terms of strength and constructability.

Installing the Stone

Specially designed hoists to carry workers up and down the building were erected at the four corners and anchored at 40-foot intervals along the tower. Monorails placed on the roof carried the stone from the hoists, across the face of the building, to their proper location. Workers removing and replacing the panels stood on swing stages suspended from the roof of the building (P/A, Oct. 1990, p. 23). An average of 120 people were working on the project per day.

To avoid damaging or soiling the granite panels at street level, the panel replacement was started at the third floor. From there the replacement moved upwards, all four sides at once. After installing the last panel at the top, workmen went back down, applying a total of 90 miles of caulking around the panels. The last step was to replace the panels at the bottom three floors of the building.

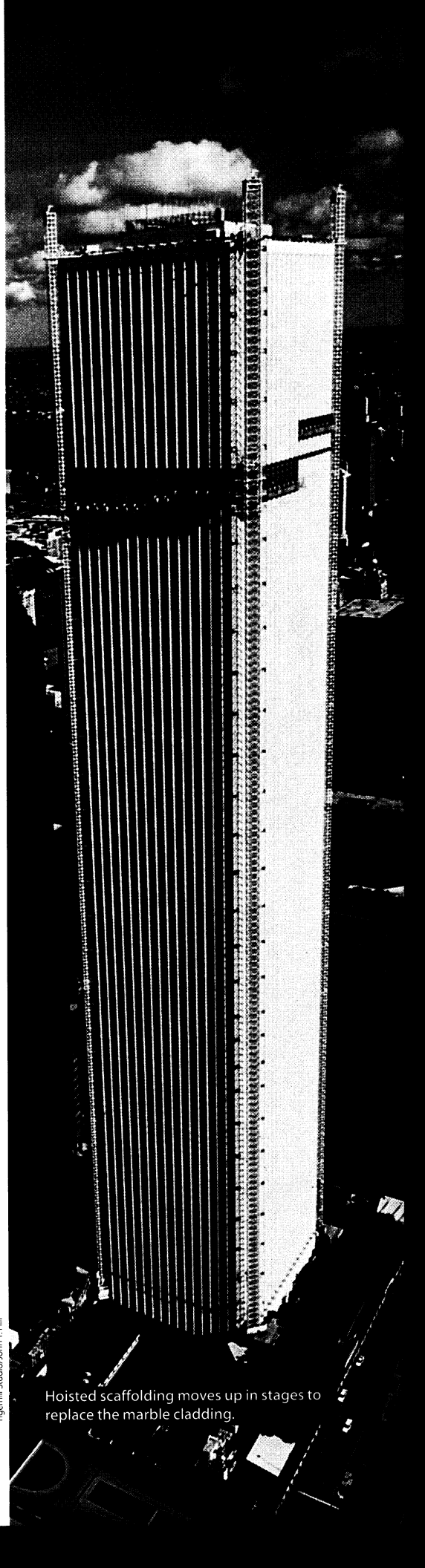
Amoco's Aftermath

The recladding of the Amoco Building cost between $70 and $80 million. Amoco's John Dombrowski says that litigation against the original architect/engineer and contractor has been settled. Results of the litigation are confidential. WJE's accelerated weathering test, and the connection testing performed during this project, have become the basis for a standard accelerated weathering test and a standard connection test for stone claddings that are now being developed by ASTM Committee C18. Most of the original panels that were removed were crushed and used at Amoco's Whiting refinery as landscaping stone. The rest of the panels were given to an organization for the disabled, who refabricated the stone into mementos and paperweights. ■

The author, an architect and writer in Denver, Colorado, was formerly with Wiss, Janney, Elstner.

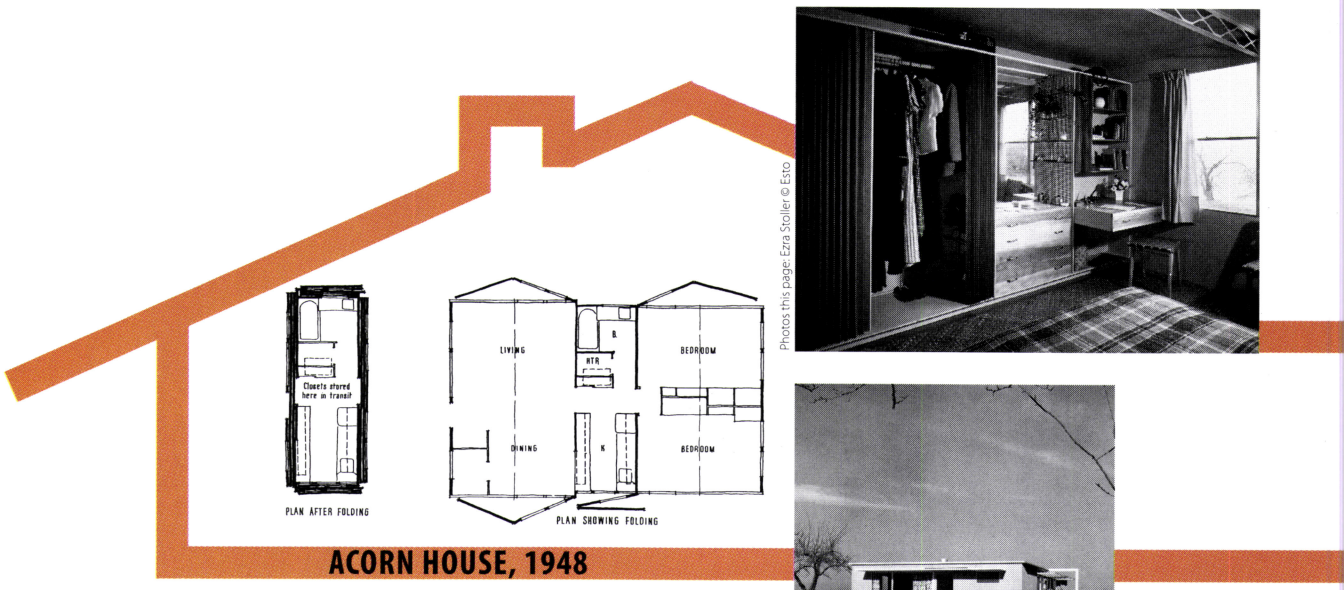
Project Credits

Owner: Amoco Properties, Inc.
Architect and Structural Engineer of Record: Wiss, Janney, Elstner Associates, Inc., Chicago, Illinois
Construction Manager: Schal Bovis, Chicago, Illinois
Contractors: Sesco (stone setter), Dayton, Ohio; Insulation Services (insulation), Chicago, Illinois; USA Hoist (hoist towers), Countryside, Illinois



Tigerhill Studio/John T. Hill

Hoisted scaffolding moves up in stages to replace the marble cladding.



Photos this page: Ezra Stoller © Esto

The Acorn house used techniques developed for the World War II aircraft industry, stressed-skin panels and insulation made of paper honeycomb impregnated with plastic. Trucked to the site and simply unfolded, it was meant to sell for only $4,500 (1949 prices). Its public reception included extensive coverage in Life *magazine, but it ran afoul of building codes.*

The Grandfather of Prefab:

Architect Bryan Irwin assesses some of Koch's contributions to industrialized housing...

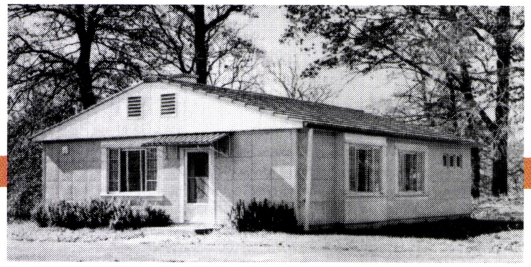
As the century ends, architecture's course seems charted by figures of Yeatsian proportions, where "... the best lack all conviction, while the worst/ are full of passionate intensity." We find ourselves unable to merge a sense of purpose with a sense of effectiveness – ideology with action. As we search for paradigms, perhaps clues can be found in our recent past, not in theory but in the careers of individuals. One such individual is Carl Koch, the bulk of whose work was accomplished in the 1950s and 1960s. Never afraid to move outside the path most traveled, as an architect, innovator, and businessman, Koch offers insights into how architects might find their way back into the center of the decision-making apparatus.

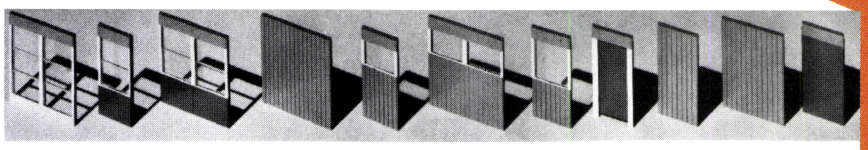
A 1934 graduate of Harvard College, Carl Koch moved directly into the Graduate School of Design at a time when it was undergoing a transformation from a Beaux-Arts institution to one at the vanguard of Modernism. As Koch puts it, "I spent my entire first year at the GSD reverently drawing the numerous plaster casts of Classical details which were scattered throughout Robinson Hall. By my third year Gropius had arrived and let it be know the antiquities were free for the taking."

Upon his graduation, Koch's first project, typically enough, was to design a house for his parents. He brought this commission to Edward Durell Stone's office and completed the job under Stone's tutelage. The house, in Cambridge, Massachusetts, was one of the first international style houses to be built in New England. (It has been Carl's residence for many years now.) A fellowship in the office of Swedish architect Sven Markelius, however, caused Koch to modify his Modernist ideals. Markelius, the architect of such structures as the Swedish Pavilion at the 1939 New York World's Fair and the Stockholm Building Society, firmly believed in close integration between buildings and their surrounding landscape.

Finding His Own Place to Live

Upon his return to the United States in 1941, Koch was faced with the more prosaic task of finding a place to live. Out of this need came his first housing community project, Snake Hill in Belmont, Massachusetts, a group of five hillside houses designed and constructed using standard detailing and materials. With their deep overhanging eaves, expansive glazed openings and exposed wood siding, these *(continued on page 86)*





The original porcelain-enamel paneled Lustron house (left) was being erected in many parts of the country in 1948, when Koch proposed a redesigned the unit (top). Instead of hanging

LUSTRON HOUSE, 1950

cladding panels on steel framing, Koch proposed 2'x 8' folded panels with their own structural integrity, which permitted numerous variations (above). Before his changes could be adopted, the Lustron Corporation had failed.

An Interview with Carl Koch

...and elicits some personal recollections and opinions from the innovator himself.

This interview with Bryan Irwin took place at Carl's house in Cambridge, Massachusetts, July 1, 1993.

Irwin: Very early on in your career you began to experiment with innovative building systems. What got you started on that tack?

Koch: Well, the initial impetus was quite personal. I was an architect – in other words I was broke – and I had a family that needed to live somewhere. Snake Hill in Belmont, Massachusetts (a development of five houses), really started as a way to enable me to afford a home. It was a sloping piece of land that builders passed over because of its difficult access. I figured out a way to make it work architecturally and then got four other homeowners involved in order to finance the venture. But along the way to completing Snake Hill, I was struck by just how antiquated our way of designing and building seemed to be. I have always been a sailor – sailing comes in a close second behind my love of architecture – and I have always been enthralled by the elegance and economy of means with which a good sailboat is built. I realized that most houses are just clumsy rafts compared to what they could be.

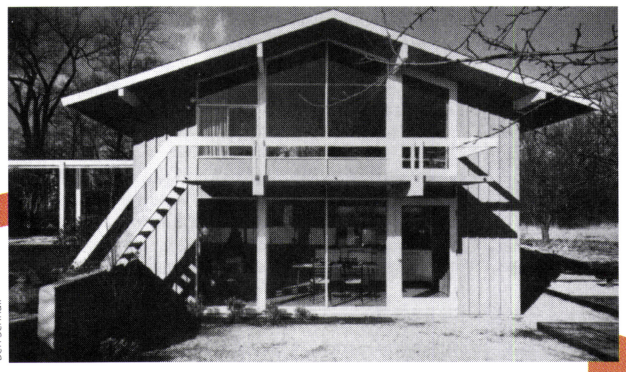
Irwin: Some of the early projects you were involved with received tremendous publicity, yet were commercial failures. What lesson did you take away from these projects?

Koch: That it is not enough to simply have a good idea. The first Acorn House is a good example. Immense effort, especially on the part of John Bemis, went into developing its system of folding stress skin panels. [A moving force behind the Acorn house, Bemis was responsible for much of the engineering as well as financial backing.] Yet no thought was given to how building inspectors around the country might respond to this, let alone how the general public, who were used to living in brick bungalows, might react to all this cleverness. The technology did not fail, rather how we brought that technology to the public failed. I am not saying we should have made it look like a brick bungalow, but we should have thought about that interface.

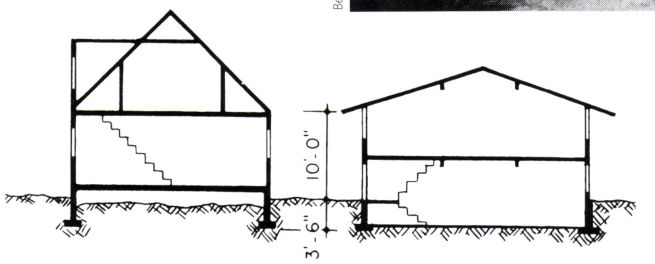
Irwin: Having had some experience in prototype design, I have come to understand why so many ideas get left at the factory door. Housing seems to have a massive amount of inertia politically, economically, and culturally.

Koch: You have touched on a great frustration of mine.

Inspired by the popularity of the attics and basements of his preceding Conantum development, Koch designed the basic Techbuilt model with a half-buried first floor and a second floor under the eaves – with the front door at the intermediate stair landing. Glazing to the roof peak at both ends lent a Modern expansiveness to the interior, while the exterior and the stressed-skin wood panels harmonized with traditional suburban settings.



Ben Schnall



TECHBUILT, 1953

On many of my projects we could not acquire the appropriate funding to research and test prototypes. In order to finance the enterprise we had to sell the prototypes. Well of course the prototypes had problems – that's why they were prototypes – but before you knew it you have a bad reputation and you are out of business. I think this is where government should step in. It has in almost every other major industry. The aircraft industry would still be on the ground if it were not for the government's subsidizing its research and development. The railroads would never have begun if it had not been for the land grants...

Irwin: ... or another example might be the enormous subsidies that have spawned the biotech industry.

Koch: That's right. I am not talking about a government handout. I am talking about money that would greatly improve everyone's quality of life and give it a much needed kick to an industry sorely in need of it.

Irwin: I am assuming one of these prototype experiences you are referring to is Techcrete, your building system based on prestressed concrete components.

Koch: Yes. The early Techcrete projects were very much prototypes. But, you know, that is another example of a failure not of the technology, but of how the technology was administered. Sadly, in this day and age I would not dream of visiting most of my Techcrete projects. Most of them are in very dangerous inner-city housing projects. I would argue that much of the failure has to do with the simple fact that the people living in these structures do not own them, therefore they simply do not care.

Irwin: As your career progressed, your work became larger and more comprehensive in scope. One might argue this is the natural progression, but I cannot help thinking in your case this was more an outgrowth of your multidisciplinary attitude toward architecture.

Koch: I really got interested in issues of urban design when I, along with several partners, brought Lewis Wharf [on the Boston waterfront] and attempted to develop it into a mixed-use residential development. This coincided with my work with Techcrete, so many of my proposals for Lewis Wharf utilized Techcrete. These two issues – Techcrete and Lewis Wharf – reinforced my fascination and frustration with urban design.

Irwin: Why frustration?

Koch: Because when it comes to our cities we have bureaucratized ourselves to death. It seems our planning agencies take their titles too literally. They want to plan everything, but not necessarily implement anything. They want to prevent "bad design" – whatever that may be – from happening, so they smother everything. Where is the vision? For all the planning that has been done, are our cities really the better for it?

Irwin: Where do you think the architecture profession is headed today?

Koch: Oh, we are a sorry lot, aren't we? I mean, we have spent so much time and energy convincing society that we as architects are above the fray, that we breathe only pure

oxygen, that we have been completely discounted by society. I still chuckle when I think back to when I was practicing. There were more than a few fellow architects who wanted me kicked out of the AIA because I was too much concerned with the business side of things. Never mind the innovations I was working on, never mind the impact I was having. I was acting too much like a – ugh – businessman. If we as a profession are ever going to find our way to a seat of power, even the most design-driven architect must realize that construction, financing, marketing – all these things – directly or indirectly affect form, and the sooner one comes to understand these subjects the more control one will exercise.

Irwin: But it goes beyond technical, market-driven considerations doesn't it?

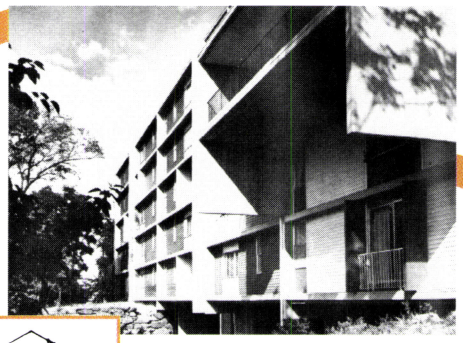
Koch: Absolutely. I would hope that it is clear from my house – from my plans – that I feel we need to design houses that are more relevant to the way we live. Not long ago I was looking at houses for my daughter. Terrible, just terrible. All these things just stuck down in the middle of a rectangle of grass. No consideration seems to be given to how people really live, the kind of spaces they really need.

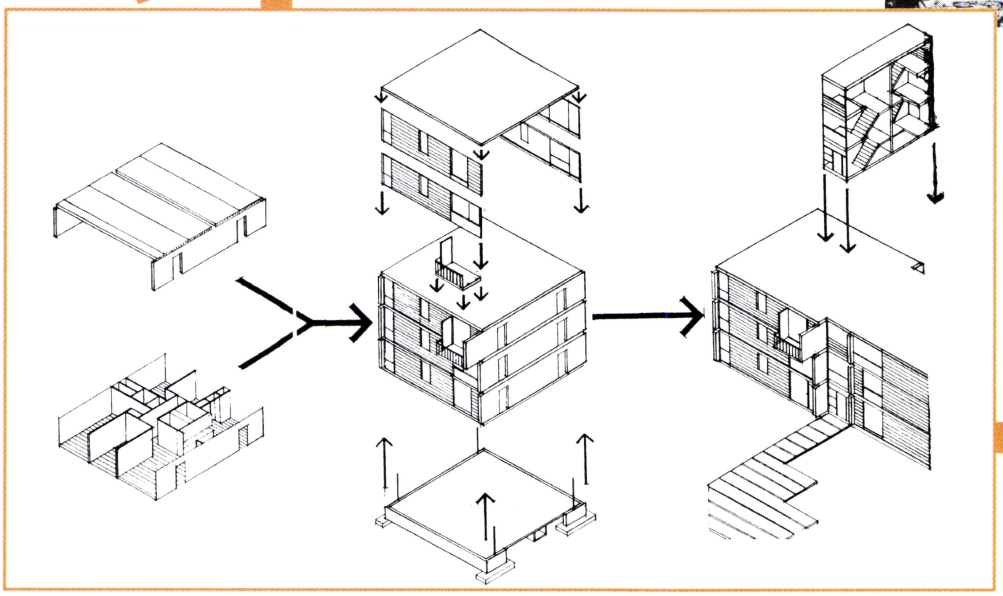
Irwin: Do you keep abreast of current architecture?

Koch: Not really. I suppose much of the debate I just cannot relate to. I mean, I cannot get too excited about the work of someone like Frank Gehry. I don't know what the purpose is. I suppose its clever, but so what?

Irwin: I think the guilt quotient among architects these days is just about as high as the unemployment quotient. Don't you see some cause for hope?

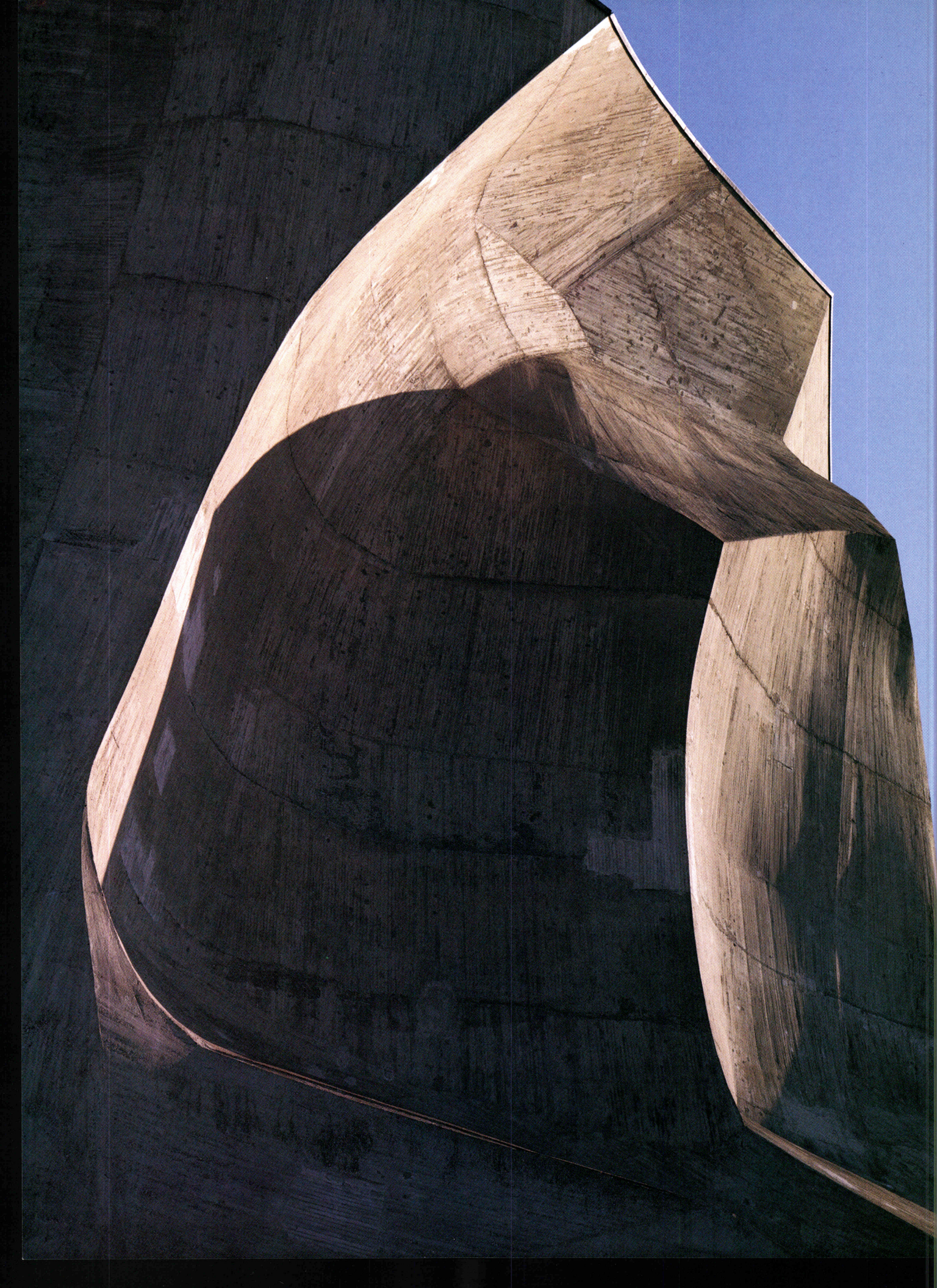
Koch: How to house people simply and with dignity, this is an issue staring straight at our society. So, I think architects will return to this challenge because it is such a compelling one. Along this line I cannot help thinking of Louis Kahn. You know, early in his career he did a tremendous amount of work in the area of low-cost construction, particularly with regards to housing. Of course in his mature years he did profound work, truly brilliant. But it was all large, institutional projects – museums and what not. Sadly, he never had a chance to return to low-cost construction, to apply what he learned at the monumental scale to the scale of the masses. That to me is where the real challenge is, how to bring dignity to the everyday. And I am optimistic. I just wish I were younger. ■





TECHCRETE, 1962

Turning his attention to multifamily housing, Koch (with engineer Sepp Firnkas) developed a system based on pretensioned precast planks, 40 inches wide and 32 feet long. Defined by precast bearing walls every 32 feet, the living spaces could be enclosed front and back with non-bearing wall and window panels, varied with projecting or recessed balconies. Techcrete was one of the systems adopted for HUD's Operation Breakthrough and was ultimately used for some 2,800 units.



NEW VIEWS BY PHOTOGRAPHER THOMAS DIX OF RUDOLF STEINER'S GOETHEANUM

the spirit of concrete

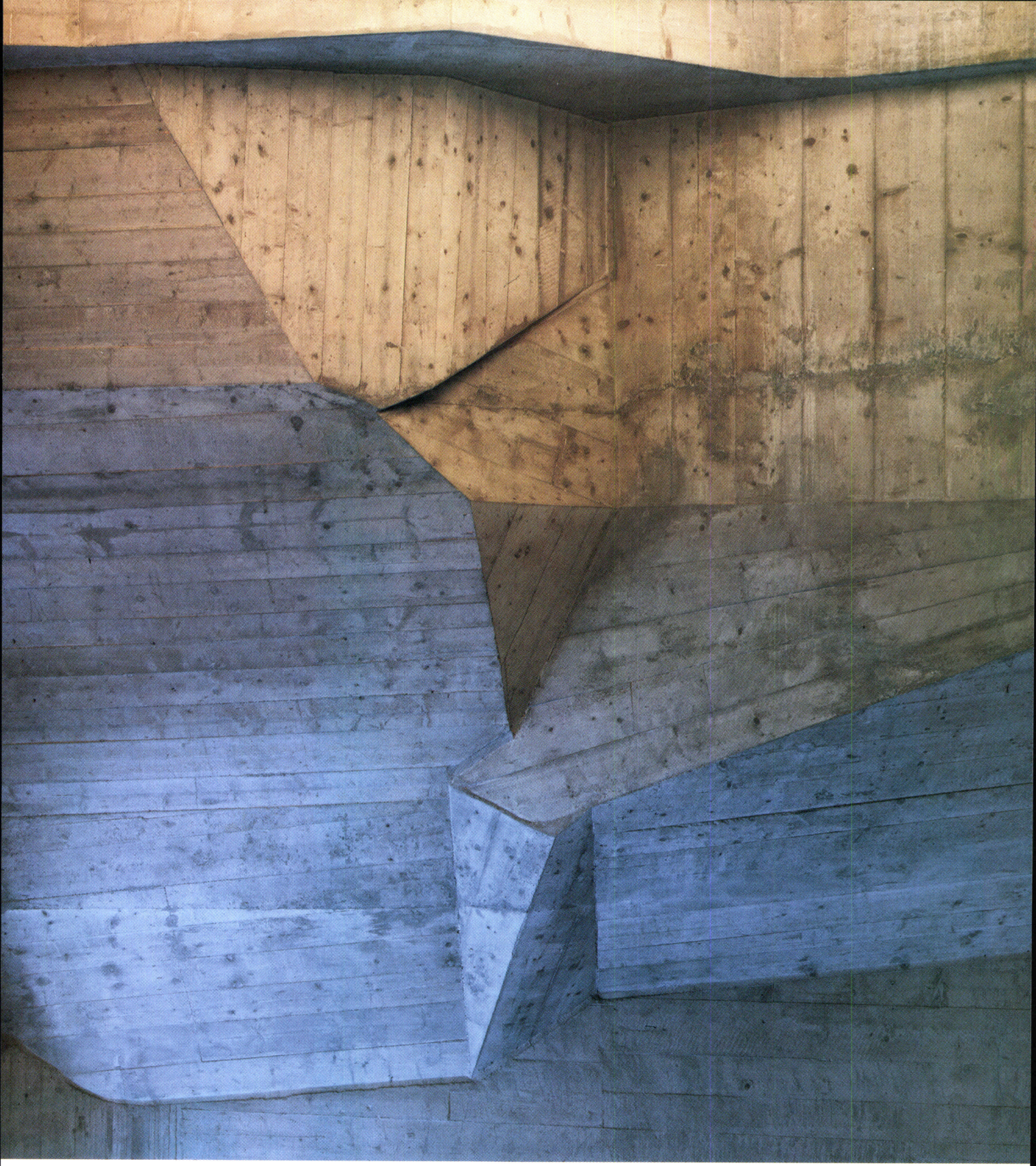
OFFER FRESH INSIGHTS INTO THE EXTRAORDINARY POWER OF THE BUILDING.

Rudolf Steiner's Goetheanum in Dornach, Switzerland, is frequently mentioned in the history books, yet the building is rarely shown in any detail. The fresh images in these pages were excerpted from a monograph recently published by Ernst & Sohn, which includes drawings, archival material, and a well-researched text by architectural historian Wolfgang Pehnt.

The massive concrete structure, completed in 1928, replaced the first Goetheanum built of wood, which burned down in 1922. The shell's sculptural surface, with its twisted ridges and hollows, presented a formidable challenge to builders; concrete's plastic potential until then had hardly been exploited. The formwork, supervised by Dornach carpenter Heinrich Liedvogel, was made of thin laths that could be bent when wet and nailed over custom-cut planks attached to the scaffolding. Norwegian slate covering the

roof forms a "skin" of glistening scales, consistent with the building's strong zoomorphic associations.

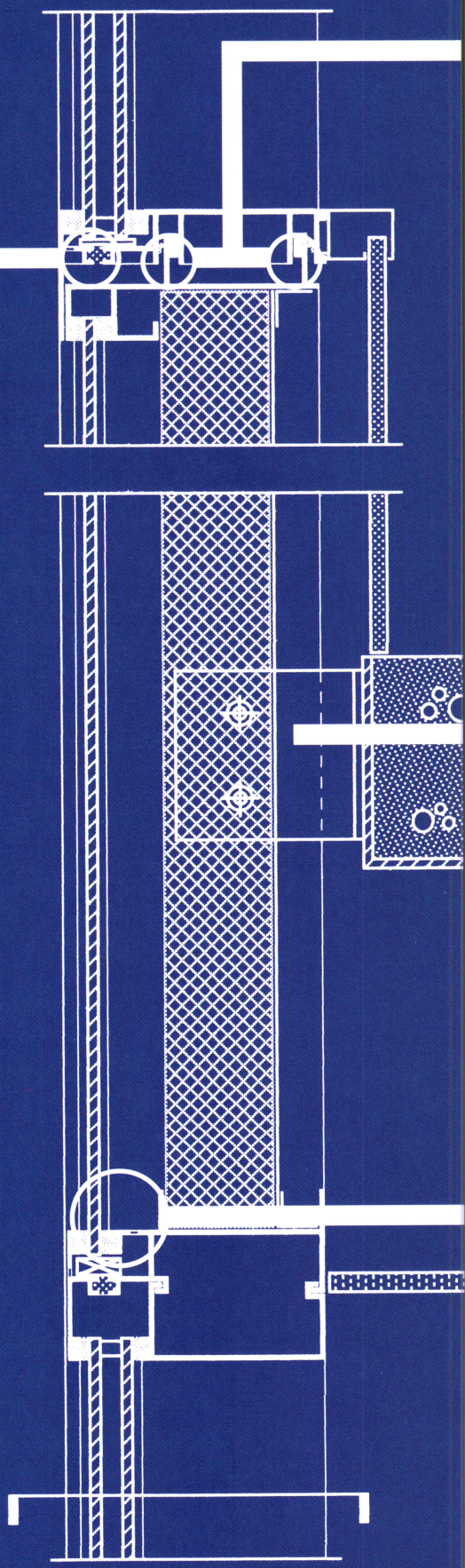
Though commonly lumped with Expressionism, the Goetheanum was designed by Steiner according to anthroposophical principles. As explained by Pehnt, access to the "spiritual worlds," central to anthroposophy, can be facilitated or impeded by architecture, according to its qualities. In this respect, at least, the links with Expressionism are more than formal: both movements sought in architecture a spiritual content and a "totality" of artistic experience. Many of the



Expressionist architects had been exposed to anthroposophy; Pehnt notes indirect connections to Bruno Taut, Hans Poelzig, and Erich Mendelsohn, and describes Steiner's more immediate influence, through his building and his lectures, on the likes of Hugo Häring and Hans Scharoun. ■

Thermal requirements may have direct effects on the appearance of the curtain wall. The amount of exterior exposed metal, such as deep projecting framing members, must be considered in terms of thermal efficiency. Effective vapor barrier design is important and becomes critical with special interior humidity levels, such as those in hospitals, museums, and computer areas. It should also be determined whether the framing members will need to be thermally broken and/or insulated. Reference standard AAMA 1503.1-88 is commonly used to evaluate and determine the thermal transmittance and condensation resistance of glazing systems.

THERMAL PERFORMANCE



What Makes a

An expert provides a performance checklist for curtain wall design, followed by a portfolio of curtain wall details selected by P/A editors

Decisions that affect the exterior appearance of a building are among the most important made during the architectural design phases. The exterior appearance is one of the first and most lasting impressions people have of a building and, in commercial projects, may affect its marketability. However, the design and development of curtain wall systems depend on more than just the desired appearance. Various key technical issues come into play and should be carefully considered by the architect early on and continuing through the design phase. These issues are best described as "performance requirements," and they directly affect the design, fabrication, function, and appearance of curtain wall systems.

The basic performance requirements that should govern the design of curtain wall systems are: allowable air infiltration, water infiltration, thermal performance, and structural requirements. These requirements directly affect wall element sizes, joint sizes, reveals, sightlines, anchorage, framing member sizes, and a host of other factors. It is also important that the various elements of a wall system (windows, curtain wall, and masonry units, for example) all have the same (or similar) performance requirements. These requirements and their potential effects on wall systems are explained on these two pages. **John R. Sturdevant** ■

The author is an associate with Heitmann & Associates, a cladding consulting firm in Chesterfield, Missouri.

AIR INFILTRATION

Allowable air infiltration requirements usually have minor visual implications on curtain wall systems. However, proper location of gaskets, weather-stripping, weeps, and caulking are critical and may affect the framing members, reveals, offsets, and other plane changes. A commonly used performance level for maximum allowable air infiltration of a fixed wall area is 0.06 cubic feet per minute (cfm) per square foot with a static pressure differential of 1.57 pounds per square feet (psf) (equal to a 25 mph wind), or 6.24 psf (equal to a 50 mph wind). A commonly used reference standard is ASTM E 283.

Good Curtain Wall?

STRUCTURAL PERFORMANCE

This requirement directly affects the wall's design in terms of framing member sizes and shapes, anchorage, reveals, and offsets. The performance requirements must include design wind loads (positive and negative), snow loads, lateral displacements due to seismic and wind forces, column shortening, and spandrel beam deflections. It is critical that the overall system plus each of the major wall elements have performance levels based on the needs of the project and the selected materials. For example, the deflection limitations for framing members supporting masonry or stone should be more restrictive than for those supporting glass. A commonly referenced structural load test is ASTM E 330.

WATER INFILTRATION

This is usually the most critical and problematic performance requirement that must be determined and designed for. The performance level is usually based on project data such as project type, size, location, and wind load data. The level of performance may affect basic design decisions such as field-erected walls versus unitized walls and pressure-equalized walls versus non-pressure-equalized walls. It also affects the framing-member sizes, shapes, reveals, and offsets. Wall systems must be designed to resist water infiltration through properly designed head heights, gutters, weeps, and flashings.

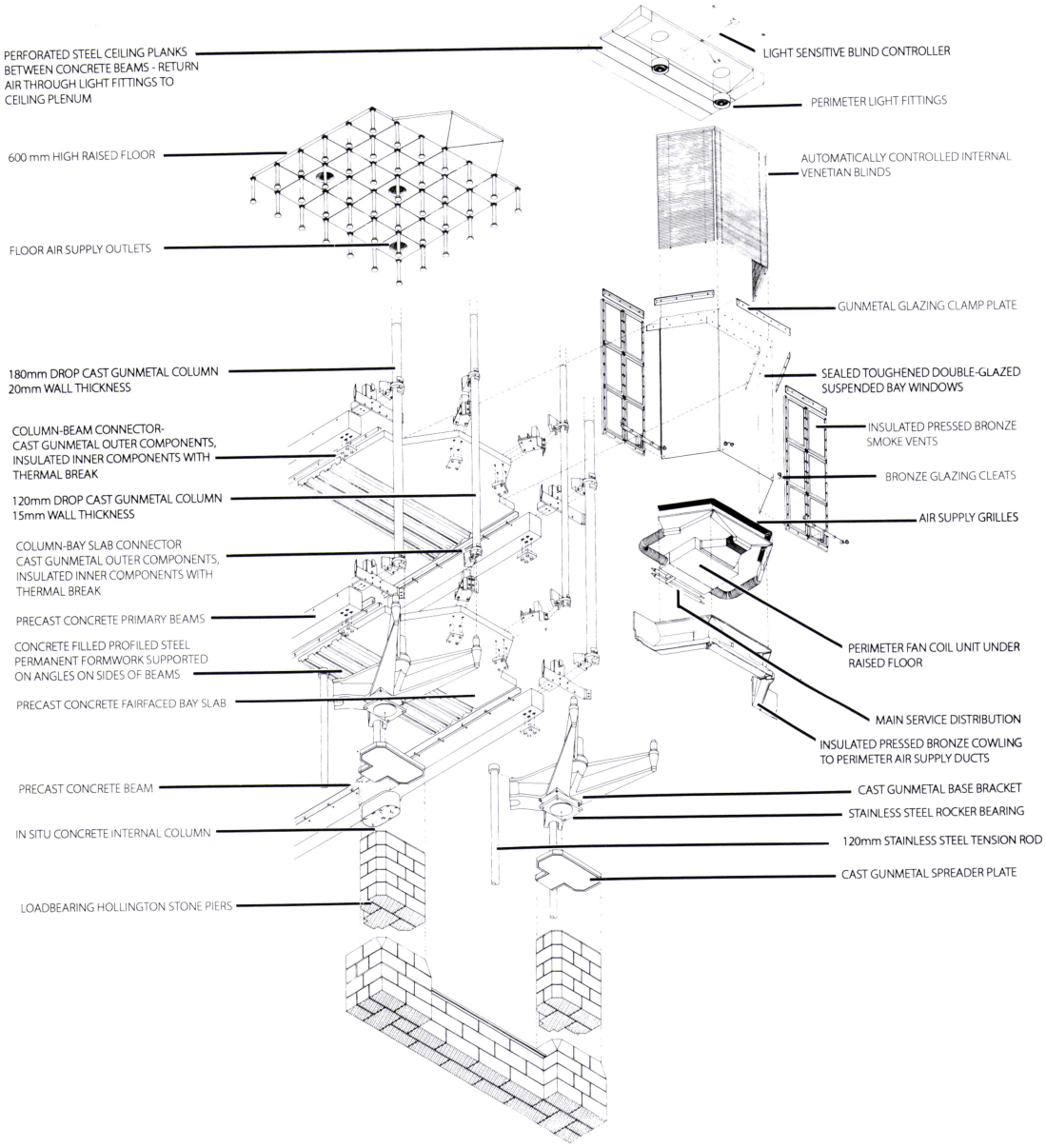
It is generally a recognized and accepted practice to assume that water will infiltrate the primary exterior weather seal, so a backup "second line of defense" system should be designed to control and weep the water to the exterior. A commonly used performance level is a static and dynamic pressure differential of 10 psf. The pressure differential may be adjusted upward or downward depending on specific project needs. The two most commonly used standards are ASTM E 331 for static pressure and AAMA 501.1-83 for dynamic pressure. The definition of water leakage in these standards should be reviewed and adjusted according to the project needs.

Photos: © Martin Charles

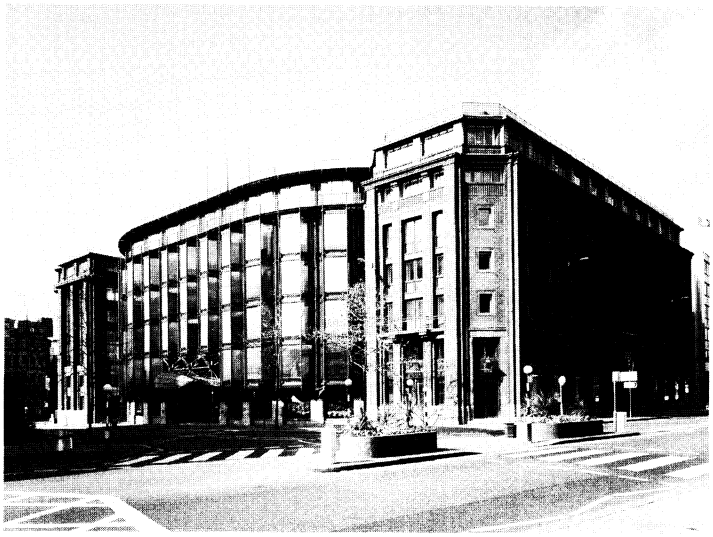
Michael Hopkins & Partners' conversion of Bracken House, former newspaper printworks and offices designed by Sir Albert Richardson in 1959, into an "intelligent" office building for a Japanese bank included replacement of the building's central block and modernization of its two landmarked wings. The London architect's six-story insertion, roughly oval in plan, both evokes the imagery of the existing wings and employs the same materials – glass, stone, and bronze.

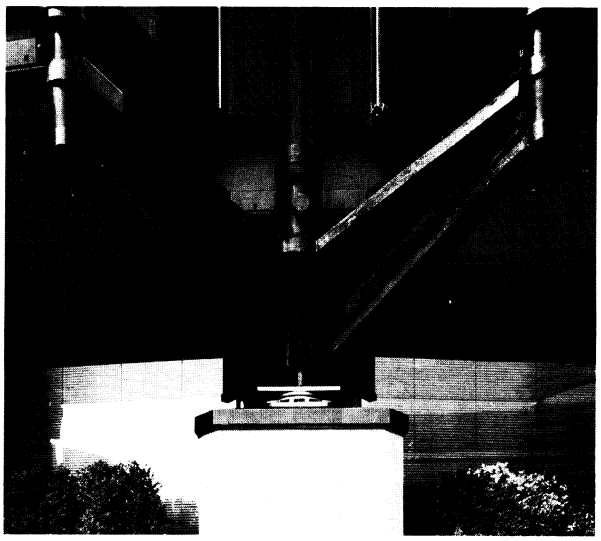
Hopkins's faceted, Techno-Gothic façade was designed to reflect the client's sophisticated level of service. Projecting bays of double-glazed panels in bronze frames are cantilevered from the main structure's reinforced concrete frame. The wall's load is transferred through delicate columns and hefty brackets, both of cast gunmetal (an alloy of copper, tin, and zinc), to load-bearing stone piers at the building's base. A zone at the edge of each floor slab is also supported by the façade. Ove Arup & Partners were the structural engineers.

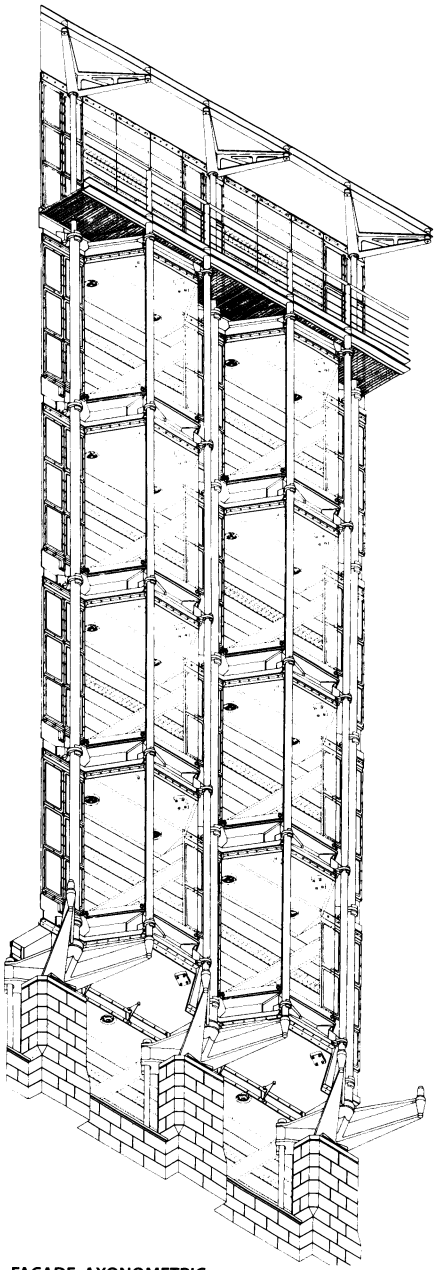
BRACKEN HOUSE, LONDON, MICHAEL HOPKINS & PARTNERS



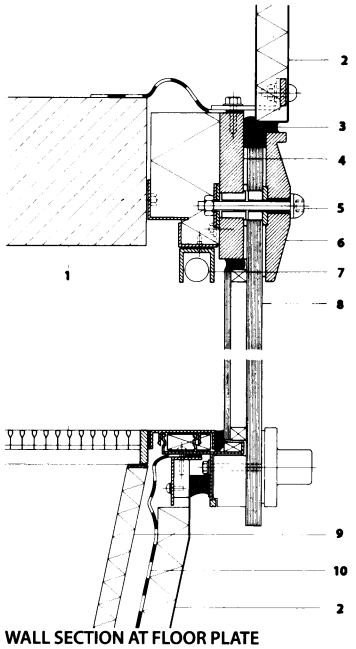
FAÇADE, EXPLODED WORM'S-EYE AXONOMETRIC





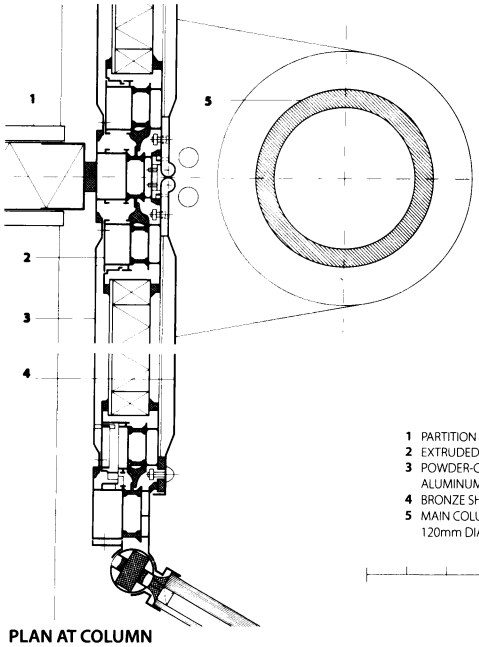


FAÇADE, AXONOMETRIC



1 PRECAST REINFORCED CONCRETE
2 PANEL, BRONZE SHEET WITH INSULATION
3 SILICONE INSULATION
4 GALVANIZED FLAT STEEL
5 BRONZE BOLT AND NUT
6 GUNMETAL GLAZING CLAMP PLATE
7 AUTOMATIC SUN BLINDS
8 DOUBLE-GLAZED UNIT
9 ACOUSTIC INSULATION
10 DAMP-PROOF MEMBRANE

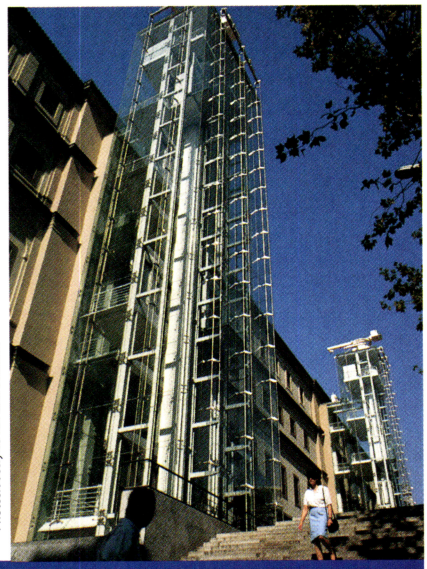
WALL SECTION AT FLOOR PLATE



1 PARTITION WALL
2 EXTRUDED ALUMINUM PROFILE
3 POWDER-COATED ALUMINUM SHEET
4 BRONZE SHEET
5 MAIN COLUMN, GUNMETAL TUBE, 120mm DIAMETER

4"/100mm

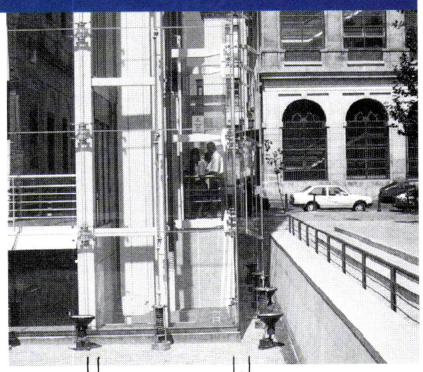
PLAN AT COLUMN

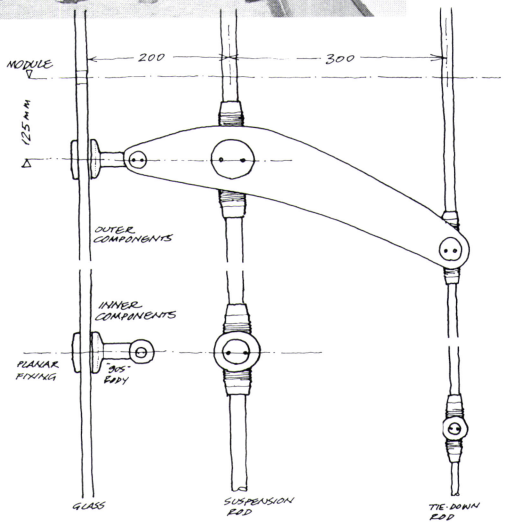


Photos: Jocelyne van den Bossche

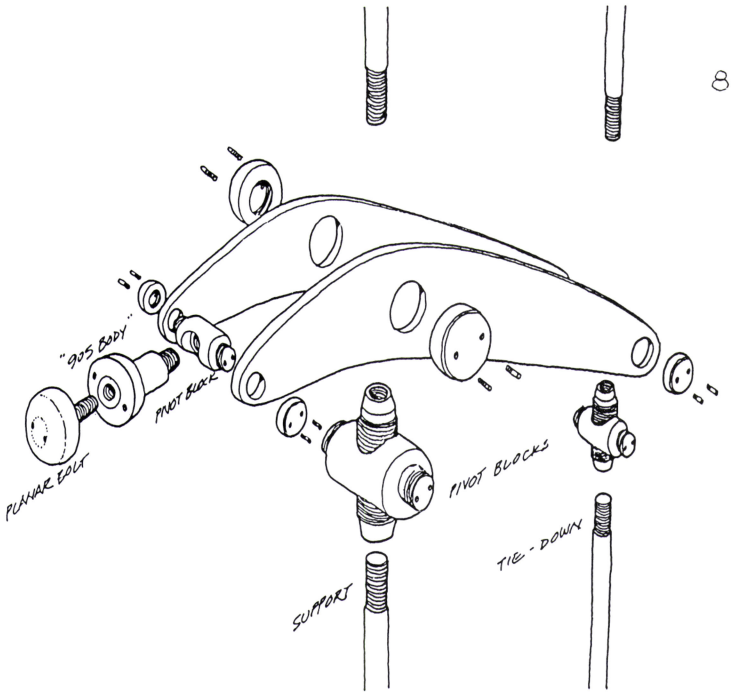
The installation of a new museum of contemporary art in an 18th-Century hospital, (actually the rear wing of a project never fully executed), required placement of vertical circulation outside the building envelope. Invited to design three external circulation shafts, Ian Ritchie Architects, London, produced shafts with all-glass envelopes suspended from the roof level by stainless steel rods. The two main towers, each 120 feet tall, act both as counterpoints to the unremarkable façade of the original building and as a grand set of columns announcing the museum's entrance (the interior renovation was designed by J. L. Iniguez & A. Vazquez of Madrid). The glass support system, designed by Ove Arup & Partners, includes external brackets that carry the vertical load of the glazing and an internal system of forked, stainless steel connector plates and shims that resist lateral wind loads. Each panel of glass is individually supported to allow differences in thermal expansion between the steel frame and the glass envelope to be spread evenly across panel joints.

REINA SOFIA MUSEUM OF MODERN ART, MADRID, IAN RITCHIE ARCHITECTS

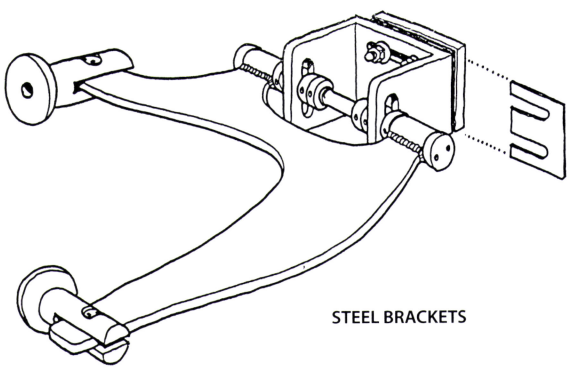




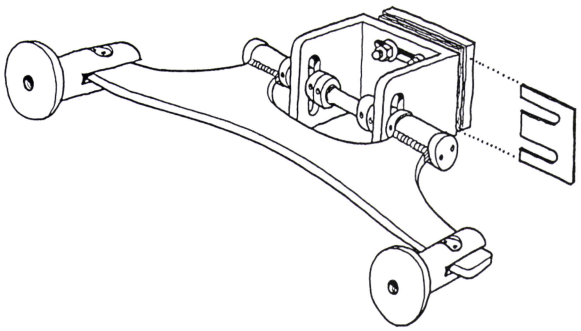
SECTION THROUGH CURTAIN WALL



GLAZING SUPPORT ARM (ABOVE AND LEFT)



STEEL BRACKETS

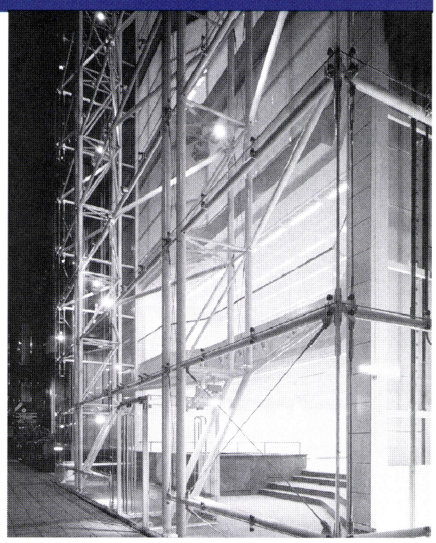


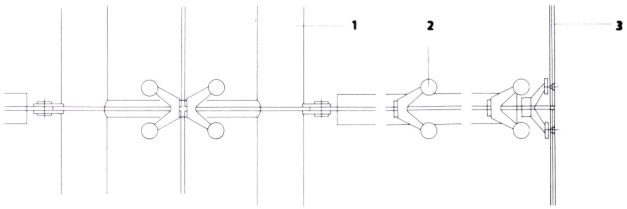
Photos: © Martin Charles

Forty years ago, a plan to widen London's Mansell Street required new buildings to be set back ten feet. The policy was recently abandoned and the ten-foot space may now be built on, but not as rentable floor space. The architects, John Winter & Associates and Elana Keats & Associates, London, of this speculative office building at 83-85 Mansell Street, just east of the City of London, chose to use the additional volume as a glazed street façade/atrium.

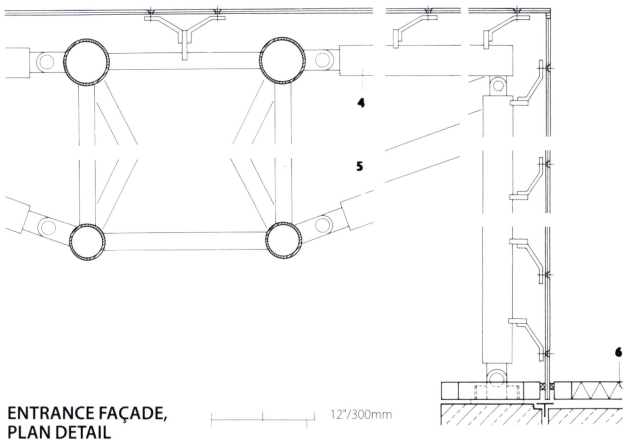
The six-story atrium is clad with glazing held in place by custom-designed stainless steel fixing cleats. The cleats are supported by cables and anchored by brackets, and both are, in turn, supported by two trussed steel tube towers. Ove Arup & Partners were the structural engineers. Glazing between the upper office floors and the entrance atrium was needed to meet fire codes and to enable the developer to rent each floor to a different tenant.

83-85 MANSELL STREET, LONDON, JOHN WINTER & ASSOCIATES AND ELANA KEATS & ASSOCIATES





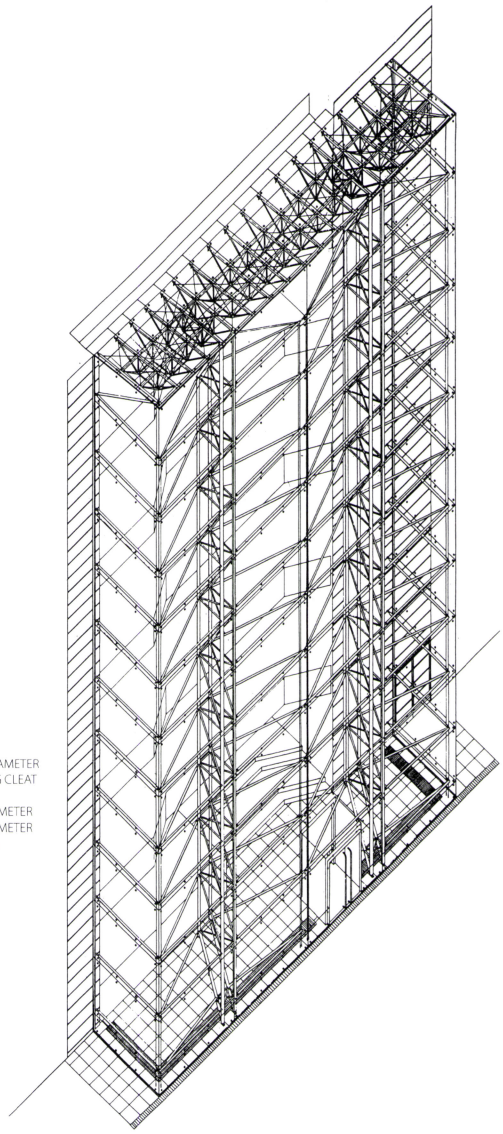
FAÇADE, SECTION



ENTRANCE FAÇADE, PLAN DETAIL

12"/300mm

1 STEEL TUBE, 140mm DIAMETER
2 STAINLESS STEEL FIXING CLEAT
3 GLAZING, 15mm
4 STEEL TUBE, 90mm DIAMETER
5 STEEL TUBE, 50mm DIAMETER
6 FAÇADE PANEL SYSTEM



FAÇADE AXONOMETRIC

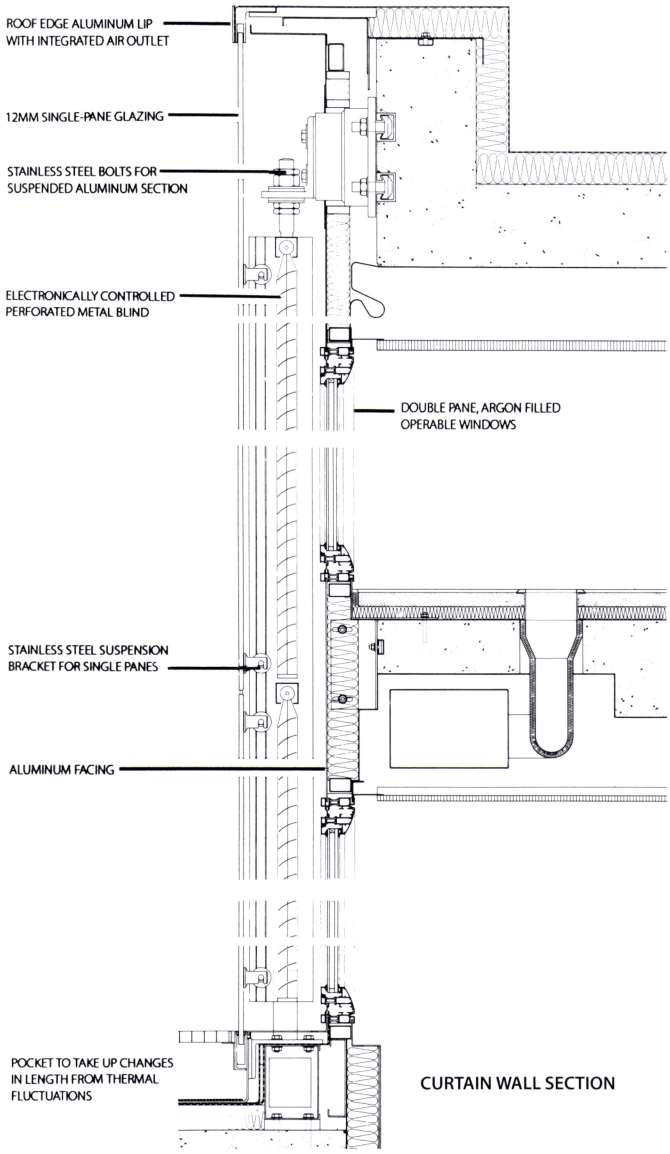
Dennis Gilbert

BUSINESS PROMOTION CENTRE, DUISBURG, GERMANY, SIR NORMAN FOSTER & PARTNERS

This eight-story office structure with a plan in the shape of a cat's eye is the headquarters for the City of Duisburg's department of business promotion. As the first project in a microelectronic business park development master-planned by Sir Norman Foster & Partners, London, the building symbolizes, through its curtain wall, cutting-edge technology. The goal was to achieve a transparent wall with shading and glare control.

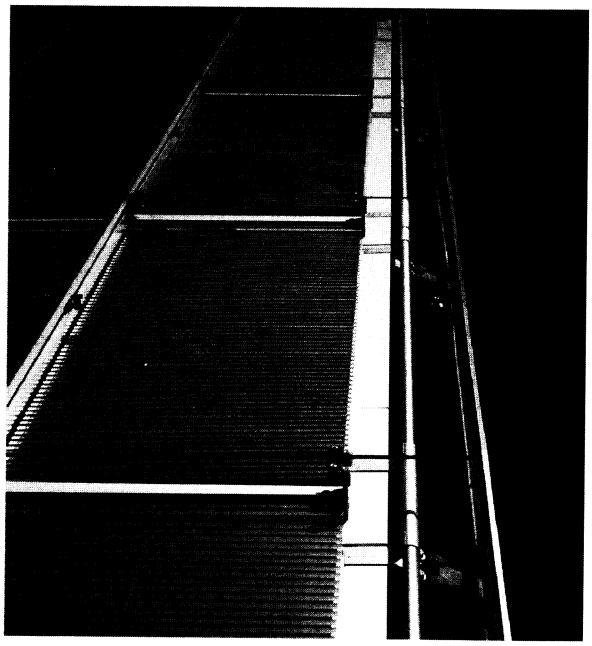
The curtain wall is a sandwich composed of an outer layer of single-pane glazing, a middle layer of computer-controlled perforated metal blinds, and an inner layer of insulated glass. The outer glass layer protects the sun-control device from the elements and air pollution. To shield the interior from heat-gain, the operable inner glass layer is thermally insulated double-glazing with a Low-E coating and argon gas between the panes. Solar-heated air is trapped within the continuous middle layer, rises to the building's top, and is vented through a plenum at the roof edge. During cold weather, this layer of warm air acts as a blanket of insulation.

Foster wanted the glass to reflect the sleek curve of the façade without the distraction of mullions. Thus, a substructure of aluminum mullions is hung from a ring beam at the roof edge. Glass panels are placed next to each other and attached to the outer surface of the mullions with screws.

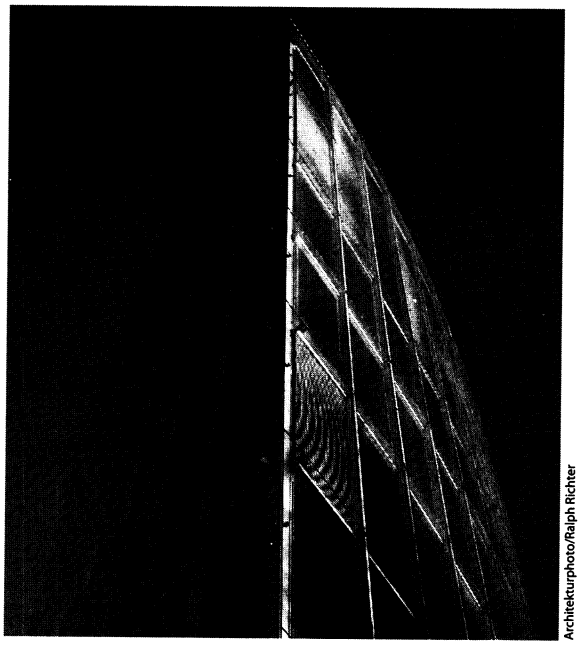


CURTAIN WALL SECTION

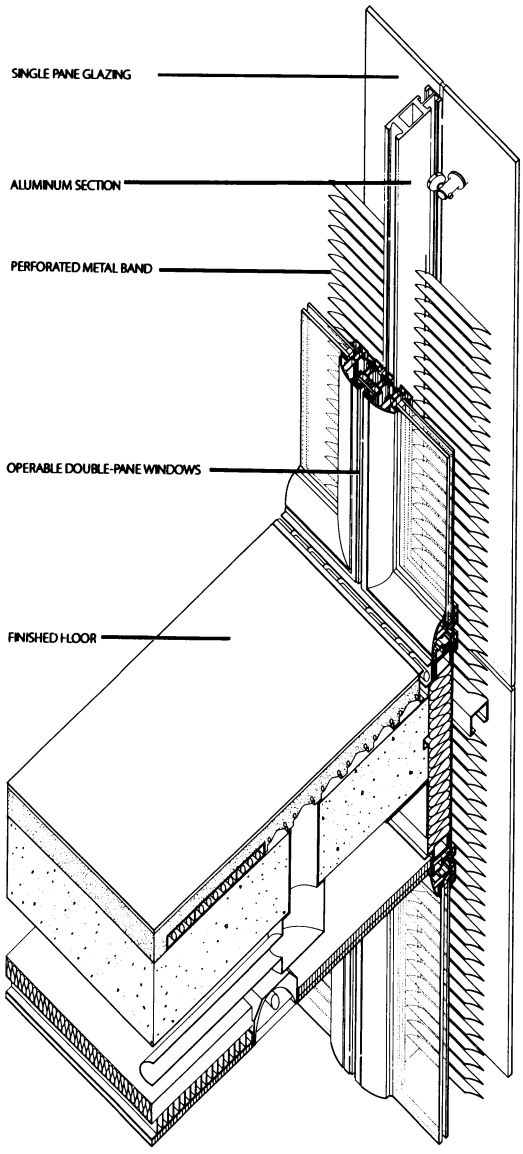
12"/300mm



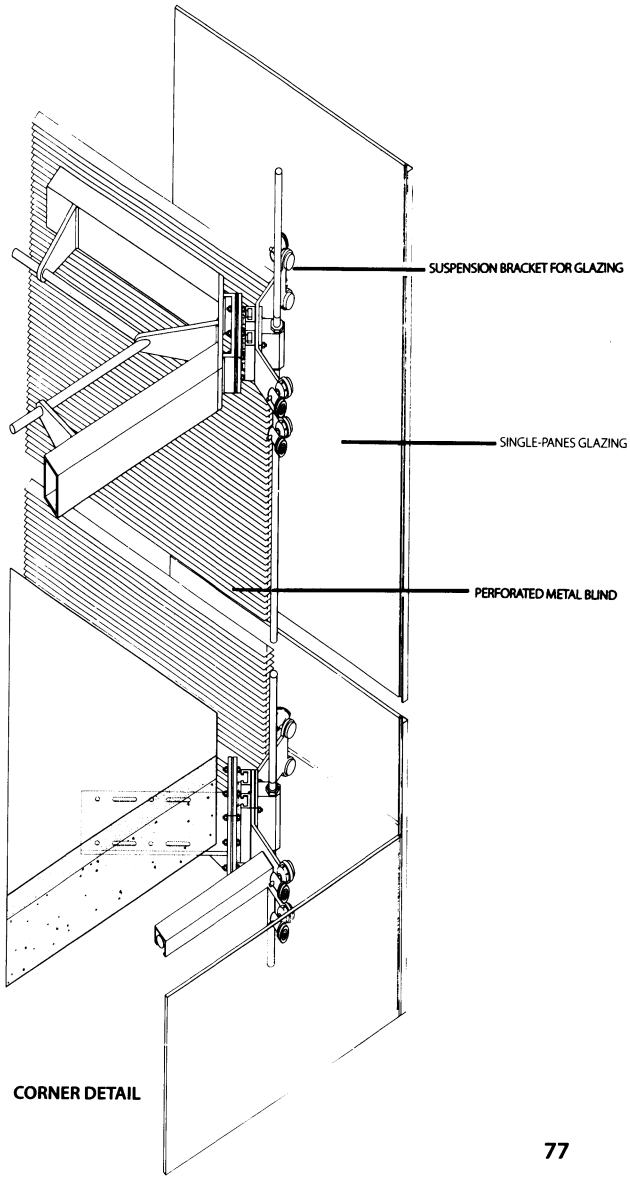
Dennis Gilbert



Architekturphoto/Ralph Richter

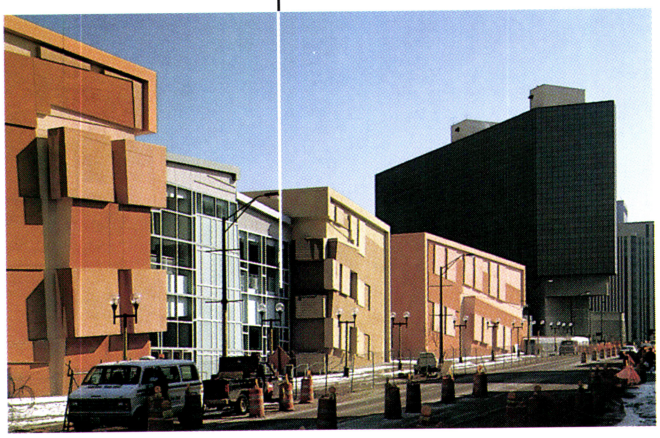


SECTION DETAIL



CORNER DETAIL

The High Street façade is the building's biggest disappointment. An attempt to match the scale of the storefronts across the street was sabotaged by an overbearing quirkiness.



The concourse is the center's most successful element, deftly balancing spatial variety and clarity of circulation. Its busy carpet pattern, though, can be hard on the eyes at first.

ARTOG/D.G. Olshavsky

Critique: Queasy in Columbus?

When you write about architecture, you develop a healthy skepticism toward architects' self-serving anecdotes about their buildings. So for the past couple of weeks, I tried in vain to confirm Peter Eisenman's claim that his Greater Columbus Convention Center actually made someone vomit.

Eisenman finally admitted to me that he had exaggerated, but he has told the story on several occasions, and he always likens it to the early days of air travel, when people became nauseated because they were being confronted with a new spatial sensation. It is as if Eisenman can't bear the fact that the convention center is, despite its outrageous aesthetics, a coherent, functional building – "Eisenman made practical," in the words of one convention center official.

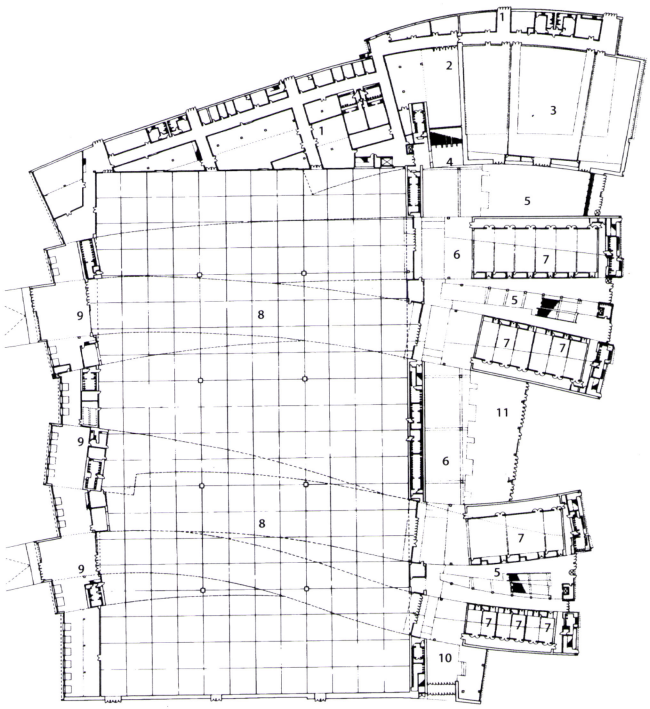
But this practicality was the main reason Eisenman Architects and Richard Trott & Partners won the 1989 competition for the center over Michael Graves Architects and Holt Hinshaw Pfau Jones. With the help of Georgia World Congress Center director Dan Graveline, the Trott/Eisenman team produced the most coherent arrangement of exhibit space, food service, meeting rooms, and circulation.

A Successful Interior

And indeed, whatever you may say about this building, you can't say that, on a basic functional level, it doesn't work. While I am no expert on convention centers, I have spent enough time lost in them to know that they're not always easy to navigate. This one is: the circulation could hardly be simpler, and the spaces are never oppressive. The concourse that runs through the building – with two "fingers" of meeting rooms on one side and the exhibit halls on the other – provides both clear circulation and an amusing spatial variety. (Part of this coherence can be attributed to the center's size: with 580,000 total square feet and 216,000 square feet of exhibit hall space, it is considered a "second tier" venue, as opposed to halls like that of the Javits Center in New York, with 720,000 square feet.)

The concourse is a memorable and delightful space, a 600-foot-long interior street with its linearity mitigated – but not destroyed – by a complex spatial rhythm involving changes in width and ceiling height. A series of skylights punctuates the ceiling and provides some natural light, even on cloudy days, and three bridges linking service spaces cross over the "street." On the meeting room side, periodic banks of glass doors opening onto the street provide welcome views outside – all too rare for a convention center. Just off the concourse, the two prefunction spaces for the meeting rooms feature characteristic Eisenman dislocation techniques such as tilting beams, columns, and ceilings.

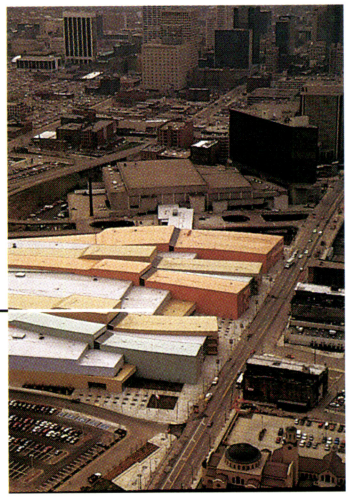
What is fascinating and perverse is that the building's simple functional diagram bears little resemblance to the



The plan (first floor, left) illustrates the boxlike nature of the convention hall itself; while the curving roof lines are dotted in here, they are invisible from within the hall. While banks of doors open onto High Street, most people enter from the north end parking lot or from the existing convention center at the south end.

1 SERVICE AREA
2 KITCHEN
3 BALLROOM
4 ESCALATOR TO OLD CENTER
5 PREFUNCTION SPACE
6 CONCOURSE
7 MEETING ROOM
8 EXHIBIT HALL
9 LOADING DOCK
10 NORTH ENTRANCE
11 CAFETERIA

N 100'/30m



The "fifth façade" of sinuous roof planes makes for fascinating photos, but most visitors are unlikely to see it unless they stay in the Hyatt Regency next door.

You can't fault Trott/Eisenman's Greater Columbus Convention Center on functional grounds, but are its gratuitous bumps and grinds a wasted effort?

by Mark Alden Branch

quirky arrangement described by the curving, pastel-colored bars of its roofscape – the "fifth façade" for which the building is best known. This "façade," which is best viewed in magazines (I never did manage to see it, since I flew in and out on cloudy days, and it wasn't in the view from my hotel room), suggests experiences that are not fulfilled within the building: the curves and varying heights of the bars, disappointingly, are not visible in the ceilings of the exhibit halls, only in floor plans where they are dotted in, as on this page. (Eisenman says exhibitors would accept nothing but a plain box for the exhibit hall interior.) While the curving bars do seem to drive the plan of the meeting room "fingers" at the front of the building, they serve mainly to organize the center's decorative program. (Yes, this building is decorated, as surely as a Disney hotel.) A busy carpet pattern changes colors to let you know that you're passing from one bar to another; different pastel paint colors perform a similar function.

The architects have expended great effort to create a metaphorical functional narrative for the building using the bars, which Eisenman likens to fiber-optic cables bringing information through the building – extending from the loading dock through the exhibit halls to the meeting rooms, and then out into the community through the High Street doors. Such a metaphor is entertaining, as are the ones Eisenman has also posited involving train cars or freeway interchanges. But in the end a metaphor that requires verbal explanation is scant justification for creating a physical condition that cannot be experienced spatially.

One Disastrous Façade

Without a doubt, the building's most visible and least successful feature is the façade that hops down High Street, a major Columbus thoroughfare connecting downtown with Ohio State University (the site of Trott/Eisenman's Wexner Center for the Arts). Very few of the people I spoke to in town had a kind word for this jumbled, storefront-scaled pastel fantasy in brick, precast concrete, and glass, which is not surprising. It is remarkably ugly, with gratuitous tilts and jogs and heavy precast concrete plugs looming over the street, and I found it more annoying than challenging or unsettling, as Eisenman might hope. Competition juror John Burgee criticized this façade as "not developed" in 1989, and it has scarcely improved; its detailing suggests a cardboard model writ large (despite the weighty materials, which vexed the engineers). Eisenman says he was in part responding to the row of turn-of-the-century commercial buildings across the street, which he successfully matches in scale. But here – as in the kitschy brick towers at the Wexner Center that are meant to recall a former armory on the site – Eisenman is at his weakest when he is at his most literal.

How could this façade be so disastrous in the hands of the architects who created such an engaging and enjoyable interior? The question becomes more puzzling when you see the graceful rear façade, where the roof bars slope down gently to meet the walls of the loading docks. Here, Eisenman is speaking the language of freeway curves rather than turn-of-the-century buildings, and he does so much more deftly. Even the north façade, a "temporary" straight wall that awaits a future expansion into the parking lot, is in its simplicity more successful than High Street. The building's signature pastel colors – Eve M. Kahn aptly described them as "SweeTart colors" in the Wall Street Journal – definitely work better on the interior than on the exterior, where they seem out of place, but I didn't find them as offensive as did some of the Columbus residents I spoke to. Eisenman, too, is not satisfied with the exterior colors; the architects' original palette of metallic colors was discarded to save $100,000, he says.

The convention hall retains some of the building's distinctive design identity when empty, but disappears into the exposition netherworld when occupied.

ARTOG/D.G. Olshavsky

What the Users Think

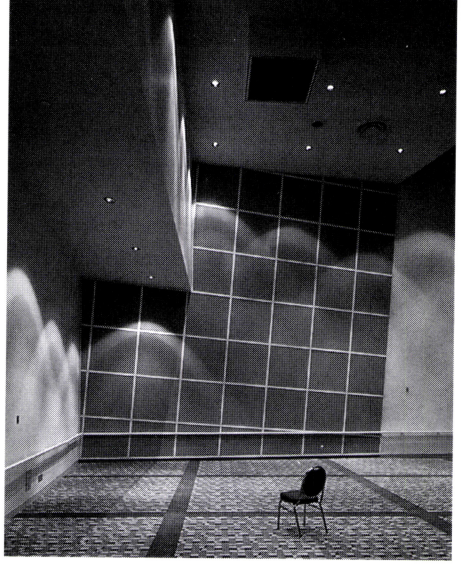
Inside, though, the building is by most accounts a success. In talking to convention center officials, an exhibit decorator, meeting planners, and attendees of the Ohio Turfgrass Foundation conference, which was in progress when I visited, I found very few gripes with the way the building works. Terry G. Walburn, an exposition contractor with the local George E. Fern Company, started our conversation by letting me know he holds architects in "very low esteem," but was mostly positive, citing the large number of loading docks (24) as a time saver. On the other hand, he said, most of the loading dock doors are too low (7 feet, except for two 10-footers), which "creates a lot more work." Linda Shetina, the center's director of operations, is happy with the building, but acknowledged that the light-colored gypsum-board walls and large areas of glass mean lots of fingerprints. She employs full-time painters (and devotes lots of space to paint storage) to cover scuff marks and other damage.

"The building's most visceral effect came not from its elaborate cranked and canted structure, but from a cheap funhouse illusion that you can try at home with masking tape and a protractor."

Walburn and Shetina cited other positive aspects of the design: because the exhibit hall floors rest on grade, there is an unlimited floor-load capacity in the exhibit halls, which will allow truckers to stage a "truck rodeo" in the space later this year. Also, the adjacent men's and women's restrooms off the exhibit hall are "gender-convertible"; that is, the wall between them can be adjusted to vary the number of women's and men's stalls according to need. (For all of Eisenman's recent talk about a "non-phallocentric architecture," this is probably one of the greatest architectural gains for women in recent years.)

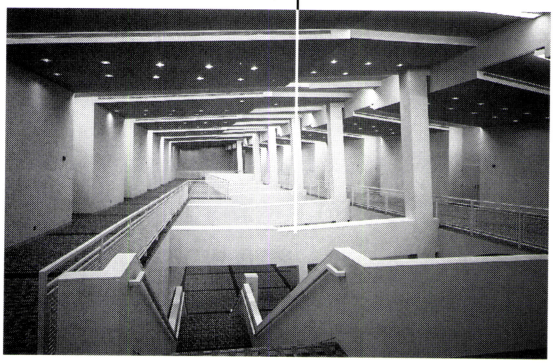
When I stopped Turfgrass conference-goers in the concourse, they told me they were finding their way around easily, but I had to prompt them to even notice the seemingly provocative architecture. Even in this building, it is easy to be distracted by the registration booths, signs, and other trappings of the convention industry. (It also occurred to me that this particular group might be occupationally predisposed to keeping their eyes on the ground.) When they did look up and around, they generally said positive things like "light and airy."

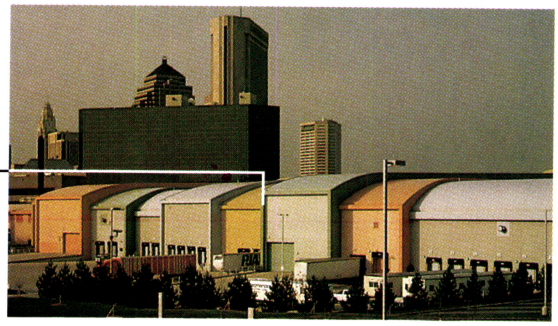
Despite Eisenman's intention to offer a spatial challenge to "the guy ... who has lost the capacity to react to the tactile environment," no one I encountered seemed physically disturbed or even engaged by the building, even in the prefunction areas, where the only true three-dimensional manipulations take place. It was the meeting rooms that originally had a disturbing power. These relatively small spaces have gridded acoustical panels that were once tilted four degrees, but were straightened up after people were bothered by the illusion that the floor was tilting. (This is where Eisenman's apocryphal story about someone vomiting comes in.) In the center's ballroom, the tilt of the panels was retained; the room is apparently large enough to counter the sensation. What is amusing is that the building's most visceral effect came not from its elaborate cranked and canted structure, but from a cheap funhouse illusion that you can try at home with masking tape and a protractor.



The ballroom still has a tilted grid of acoustical panels, causing the illusion of a sloping floor. The grid was squared up in the smaller meeting rooms after people complained.

The pre-function areas employ some of Eisenman's characteristic dislocation techniques, with tilts, shifts and unlikely beam placements.





The rear façade, which backs up to the freeway, more gracefully resolves the ends of the roof bars. The loading docks – all-important to exhibitors – get mostly enthusiastic reviews.

Was it Worth the Trouble?

If you can't see the curving bars of the "fifth façade" or experience them volumetrically, if the High Street façade fails to delight, and if the building doesn't even make the average Turfgrass enthusiast queasy, then were the building's elaborate tricks worth it? Although the building's cost ($94 million) is in line with centers of comparable size, its idiosyncrasies were apparently costly. Early on, work on the center stalled for six months so engineers could work out the geometry and steel fabrication, according to *Engineering News-Record*. The steel fabricator says that inadequate drawings of the complicated structure cost him $4.7 million. (His suit against the convention center was resolved in an undisclosed settlement.) And the masonry contractor says that, although he didn't lose money, installing the 92,000 tilting bricks on the High Street façade took twice as long as a conventional job.

But function and aesthetic satisfaction are not the only criteria for judging a building like this: convention center officials relentlessly promote the center's unique appearance as a marketing tool. "Convention centers used to look a lot like this," a narrator explains in a promotional video over a computer-generated image of a low black box. "Welcome to the future," he continues as the box is stripped away to reveal this convention center – seen, of course, from above.

"You may not like it, or you may love it," Convention and Visitors Bureau president Ty Stroh told the *Columbus Monthly*, "but it still makes a statement." And that statement may make a difference in the competitive convention industry. Says Debbie Lewis, who ran a motorcycle trade show in the space for Action Motor Sports: "We're very fond of the architecture. We want to do anything we can to dazzle the attendees."

Successfully meeting programmatic requirements, creating a very good interior space, and providing a slight marketing edge are important achievements, and for those the architects are to be lauded. But don't let Eisenman fool you into thinking the building is revolutionary. He has – with mixed success – manipulated form and space to create something that looks new, but when you come down to it, this convention center is, well, almost conventional. ■

Project: Greater Columbus Convention Center, Columbus, Ohio.
Architects: Eisenman Architects, New York, and Richard Trott & Partners, Columbus.
Consultants: Lorenz & Williams, Dayton, Ohio (structural, mechanical, and electrical engineering); Moody/Nolan, Columbus (civil engineering); Phillips Graveline Facility Development, Atlanta (convention center consultant); Oregon Group Architects, Dayton (codes); Simpson, Gumperts & Heger, Arlington, Massachusetts (roofing); Mayer/Reed, Portland, Oregon (graphic design); Jules Fisher & Paul Marantz, New York (lighting); Jaffe Acoustics, Norwalk, Connecticut (acoustics); Image Engineering, Somerville, Massachusetts (electronics).
Construction manager: Turner/Smoot/Zunt, Columbus.
Photos: Jeff Goldberg/Esto, except as noted.

Technics Q+A

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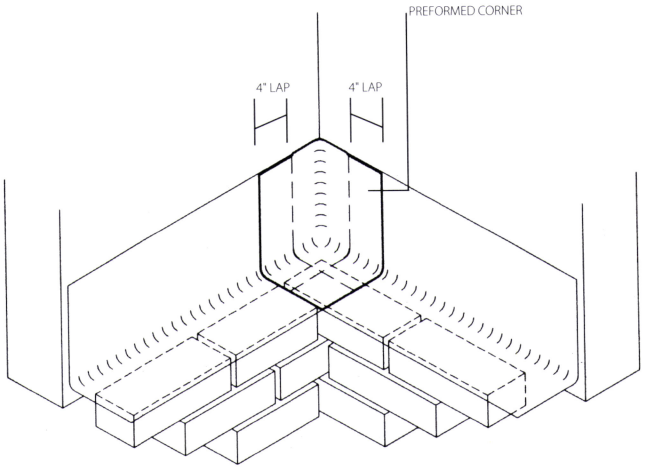
Tips from the pros on how to detail and install elastic flashing and what to do about delaminating tile.

Q: Elastic Flashing

Experience has shown that the use of elastic flashing in cavity walls can lead to water leakage, particularly at internal and external corners. How can we avoid leakage problems at these corners if we continue to use elastic flashing?

Joan Fasulo
Campus Planning and Construction,
Trenton State College
Trenton, New Jersey



ELASTIC FLASHING CORNER DETAIL

Evan Goldenberg, R.A.

A: Watertight corners can be achieved by preforming the elastic flashing material into the shape of the corner prior to its installation. However, stringent specification provisions must be established and enforced to provide for long-term watertight performance.

Unlike metal flashing, elastic flashing is not readily formable. Formability can be achieved, however, when uncured neoprene elastic flashings are specified. Neoprene may be shaped to almost any profile in its uncured state when it has the flexibility of plastic wrap. To preform corner flashings, a form molded to the required corner profile should be constructed. The design of the form and the neoprene sheet size should be selected to permit a seamless corner for maximum watertightness. Form materials that will not impart residues to the neoprene should be used; such residues may prevent bonding of adhesives and sealants to the neoprene.

The uncured neoprene is placed on the form and cured using a portable hot air blower. Once formed, much of the potential for leaky seams will be eradicated at the corners; however, careful workmanship is required to avoid damage to flashing and for proper installation and adherence of the preformed corner to its adjacent straight-run counterpart. The specification should require as an absolute minimum that all cavity flashings, regardless of their material make-up, be installed by experienced tradespersons. Masons and carpenters should not be permitted to install flashings. Those skilled in the use of elastic flashing materials (primers, solvent wipes, flashing adhesives, and sealants) and their placement can be found within the roofing and waterproofing trades.

The specification should also require that the contractor submit flashing shop drawings; and the flashing should be inspected as it is being installed. This will ensure that the flashing materials you specified are being installed in accordance with the shop drawings and specifications.

Timothy T. Taylor, AIA, CSI, ASTM
Skidmore, Owings & Merrill
Washington, D.C.

"If a tile system has water beneath it, it is likely that the high moisture conditions are contributing to the failure, but some other factor is directly responsible for the delamination."

Q: Tile Delamination

We have had problems with delamination of slip-resistant quarry tile installed on exterior patio decks. It appears that water is getting under the tiles, possibly through the joints, causing them to separate from the structural concrete floor slab. After the floor tiles are repaired, is there a clear sealer that can be used over the tile and joints to eliminate this problem? Also, is there a maintenance program that should be followed to prevent future problems?

John E. Rowe
Blivas, Fiala & Rowe Architects
Sarasota, Florida

A: Whenever you experience ceramic or quarry tile delamination, it is important to understand the cause of the tile failure before attempting to implement repairs. Tile delamination can occur for a variety of reasons, including poor workmanship during installation, improper substrate conditions, poor design or inadequate specifications, an unsuitable environment, or incompatible materials.

Properly installed tile systems are well suited to exterior environments. In fact, ceramic tile installations using portland cement-based setting-bed mortars are typically not subject to water deterioration even when submerged (ceramic tile liners on concrete swimming pools are a good example).

Conservative use of materials is imperative for a good repair. Careful consideration should be given to the intended end-use of the installed tile. For instance, a polyvinyl-acetate-based latex setting bed is not prudent in water submersion or exterior environments since this type of polymer-modified bed and jointing grout can chemically degrade under moist, alkaline conditions. If a tile system has water beneath it, it is likely that the high moisture conditions are contributing to the failure, but some other factor is directly responsible for the delamination. Water ingress into the tile system, in other words, is often a contributor rather than the root cause of delamination.

Once the cause and degree of the tile delamination is determined, repairs can be undertaken to correct it. The designer of the repair must specify proper materials, elastomeric jointing, and adequate repair techniques such as surface preparation that are in accordance with ANSI A-108 American National Standard Specifications for the Installation of Ceramic Tile, the Tile Council of America Handbook for Ceramic Tile Installation, and materials manufacturers' specifications.

A sealer can be applied to the jointing grout, but it is typically not applied over non absorptive tile. Use of a 100-percent-acrylic-solvent-borne sealer that is further solvent-thinned to give it penetrating sealer characteristics may help reduce water uptake in fine cracks, but such cracking in ceramic or quarry tile installations is typically caused by movement in the tile system. Cracking will probably reoccur at such locations unless proper jointing is installed to control movement.

Tile installations are generally maintenance free (other than for aesthetic concerns) provided appropriate materials have been installed properly.

Paul D. Kofoed
Senior Chemist
Erlin, Hime Associates Division of Wiss, Janney, Elstner Associates, construction materials consultants
Northbrook, Illinois.

Readers are invited to submit questions regarding technical issues. You can mail, phone, or fax your questions to the attention of Michael J. Crosbie, Senior Editor, Technics. The answers are presented in good faith, but P/A does not warrant, and assumes no liability for, their accuracy, completeness, or fitness for any particular purpose. ■

(continued from page 49) years, in the number of small specialized "boutique" firms, of associations between offices with complementary specialities, and of architects offering clients diagnostic services, be they energy analyses or ADA compliance checks. What began as ways to survive the recession may end up being good preparation for the future.

Legal Model

A second model for practice is that of law. At the turn of the century, the legal profession faced problems of oversupply similar to our own. There were too many lawyers for the traditional jobs available, compensation was depressed, and yet new law schools were opening up in universities all the time. But that profession did not reduce its numbers or start closing schools. Instead it began to reconceive itself, viewing a legal education not as a preparation to try cases in court, but as a way of thinking about and analyzing problems. The result, almost a century later, has been a remarkable expansion of the legal turf, with lawyers as likely to head corporations or occupy political office as they are to try cases.

"The very idea of what constitutes architectural practice requires substantial expansion."

The architectural profession is in a position to make a similar transformation. Instead of seeing our education as a training in the design of buildings, some are beginning to see that what we really learn is how to assimilate large amounts of disparate information and find ways to order it and apply it to particular settings. Many of the submissions to our last Young Architects issue (July 1993), for example, were by architecturally trained people applying their education to a wide range of activities, from set design to software design.

Such pursuits, of course, are partly a result of the recession, which has resulted in too many graduates and too few traditional jobs. But I think something else is going on: a process of diversification within the profession, where traditional practice is increasingly seen as just one (and maybe not even the most desirable one) of many careers where an architectural education can make a contribution.

In that light, education aimed primarily at developing building designers may be too narrow an ambition, as one would say of a legal education that turned out only trial lawyers. Were we to embrace the legal model, we would have schools that offer a range of studies (of which building design would be just one), based on a definition of architecture as a unique form of synthetic analysis and the architect, according to Webster, as "one who plans and achieves a difficult objective."

The Engineering Model

Engineering, of all the major professions, is closest to architecture and it faces some of the same dilemmas that beset architects, such as lack of public visibility and attacks on its traditional turf. Accordingly, there is relatively less to learn from the engineering profession – with one exception.

Engineers offer architects a model of a design profession thoroughly grounded in research and committed to developing its knowledge base. Were we to do the same, we would attend more to the consequences than to the intentions of our work, would depend less on rhetoric and more on the quantification of what we do, and would share our failures as well as our successes.

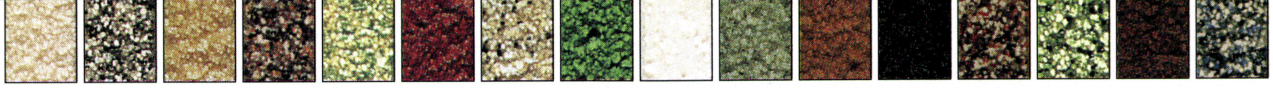
Whatever the reasons for this – poor instruction in research methods, inadequate fees to conduct post-occupancy evaluations, unfounded suspicion that such efforts will destroy the art of architecture – the results seem clear: we have lost ground to other disciplines, including engineering, that are better able to predict the effects of what they do and prove that they add value to projects.

There are signs that this may be changing. A number of architecture schools, faced with survival in research-oriented universities, are now looking at ways of strengthening their curriculum in this area. Some firms have begun a policy of making periodic unpaid visits to old projects. And it seems as if architects are more willing than in the past to talk about what went wrong on jobs as well as what went right. Still, we have a long way to go.

Saving Us from Ourselves

What is difficult about this moment in the history of the profession is that the field is moving in so many different directions at once. Changes are occurring in the structure of architectural firms and the scope of their services, in the goals of architectural graduates and the careers they are pursuing, and in the nature of architectural education and the responsibilities of the schools. Observes Peter Rowe, the Dean of Harvard's Graduate School of Design and the spearhead of an excellent series of symposiums there on this subject: "The very idea of what constitutes architectural practice requires substantial expansion ... (and) the conceptual models and, indeed, the language or terminology by which we discuss these matters must also be revised."

The real obstacle we face in the future may not be an unwillingness on the part of architects to change, but a resistance on the part of the profession's institutions – the accrediting and licensing boards, the professional associations and the schools, even the magazines – which have a vested interest in maintaining the status quo. If there is one lesson to learn from other fields is that the profession must not become its own worst enemy. ■



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(continued from page 62) houses betray a Modernist training tempered with Markelius's organic sensibilities.

What followed was a long string of houses, residential communities, and construction systems that investigated low-cost construction strategies. The first of these was the Acorn House (with architects Huson Jackson and John Callender), a post- war effort at designing and building a completely prefabricated and prefinished house. Intending to capitalize on America's unused wartime industrial capacity, Koch's Acorn House generated enormous interest. Unfortunately, between an industry unwilling to gamble on prefabricated houses and a building code unable to classify the structure (no studs, just two-inch- thick walls – with hinges on them!), any effort at mass production was doomed.

Wartime Knowhow Misapplied to Housing

In 1948 Koch was hired as a consultant to the Lustron Corporation. Established in a former airplane plant outside Columbus, Ohio, Lustron represented an investment of $35 million, with the intention to prefabricate 40,000 steel-framed, steel-clad houses a year – one every seven working minutes. Koch was to redesign the original Lustron prototype, a house that had been cobbled together from sketches by a previous architect and "stylized" by Lustron's staff designers – most of them veterans of the automobile industry.

Koch's redesign of the Lustron House reduced the number of components assembled on site from 3,000 to 37, and the weight of the house from 12 to 9 tons; he also reworked the floor plan to yield four options from the same components. Unfortunately, what Koch could not address was the internal workings of Lustron itself. Issues such as distribution, dealership, and sales were never adequately addressed, and by 1950 Lustron Corporation was in receivership.

Throughout the Lustron venture, Koch had been uncomfortable with how the units had been planned with no thought to the resulting site plans. In 1951 he had his chance to study the issue in his next venture, the Contantum development in Concord, Massachusetts, one of the first examples of a residential community using cluster siting. Forty acres of the 195-acre development were set aside as common land, and the 104 building lots were laid out to give all residents maximum access. The units Koch designed (with Leon Lipshutz, Fritz Day, and Margaret Ross) were not prefabricated, but designed on a standard module, precut on site, and built in a straightforward manner. The attic and basement were intended to be habitable spaces, with the ideal siting leaving the basement above grade on at least two sides.

An Attic Sitting on a Basement

One outgrowth of the Contantum enterprise was the Techbuilt house, begun in 1953. The Contantum experiment had taught Koch that two of the most successful and popular spaces were also the least expensive to build: the attic and the basement. And so the Techbuilt house could most accurately be described as an attic sitting on a basement. The shell of the house was constructed of plywood and 2 x 4 stressed skin panels based on a four-foot module and trucked to the site to be erected by a crew of four men in two days.

Equally innovative was the manner in which Techbuilt houses were made available to the public. Seasoned by his earlier experiences, Koch incorporated Techbuilt and made a stock offering of 120,000 shares. Techbuilt then established manufacturing relationships with various manufacturers around the country to fabricate the panels. Builders were given franchises only after undergoing a preapproval process - a process Koch wishes had been even more rigorous to weed out some questionable builders who jeopardized Techbuilt's reputation.

The Techbuilt houses received widespread public acceptance and achieved some amount of success, for many of the reasons earlier ventures had not. With their simple pitched roofs and low profiles, they could fit into any neighborhood. Unlike the Acorn house, with its innovative materials and structural acrobatics, the Techbuilt house grew out of existing technology and building practices, so it more readily conformed to building codes across the country, and its production could more easily be decentralized. During the late 1950s and early 1960s, thousands of Techbuilt houses – and their imitators – were erected across the country.

An Urban Scaled System

What began in 1962 as a study on low-cost housing for the Boston Redevelopment Authority resulted in one of the most ambitious of Koch's enterprises: the Techcrete building system. Developed in association with the structural engineer Sepp Firnkas, Techcrete was a low-cost component system for building both low- and high-rise housing, an open-ended framework of precast concrete units spanning 32 feet that could be either stacked repetitively or extended horizontally. With this flexible system of relatively standard components, it was possible to achieve a wide range of uses and appearances to adapt to various sites, densities, and local preferences. Over 2,800 units of housing were produced in the 1960s using the Techcrete system.

At a time when the profession is becalmed, Carl Koch's work reminds us of the ways architects can affect society. His impatience coupled with an implacable optimism (witness the title of his 1958 book , *At Home With Tomorrow*) brought a kind of Yankee ingenuity to the cause of low-cost, affordable housing. Carl Koch's work chronicles a time when the myth of the future was stronger than the myth of the past and this, after all, is the tenet upon which Modern architecture rests. ■

Bryan Irwin is a principal in the firm of Abacus Architects & Planners, Boston, competition-winning designers of the P/A Affordable House (P/A, Aug. 92, p.44); he is currently a visiting critic at the Rhode Island School of Design.

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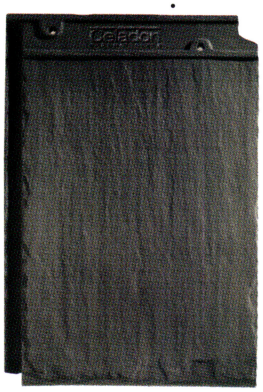

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This issue of P/A is a very different kind of magazine from those you received last year. In planning for future issues, it is crucial for us to gather reactions from a large number of readers. So after you have perused this issue – reading whatever captures your interest – please take a few minutes to answer the questions below and FAX your opinions to us at (203) 348-4023. The editors of P/A will be very grateful for your help!

Circle the appropriate number on the scale below:

How would you rate this issue for accessibility/ease of reading?
Very easy to read 5 4 3 2 1 Very hard to read

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What part(s) of this issue did you particularly like?

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Are there any features of past P/As, not found in this issue, that you would like to see continued?

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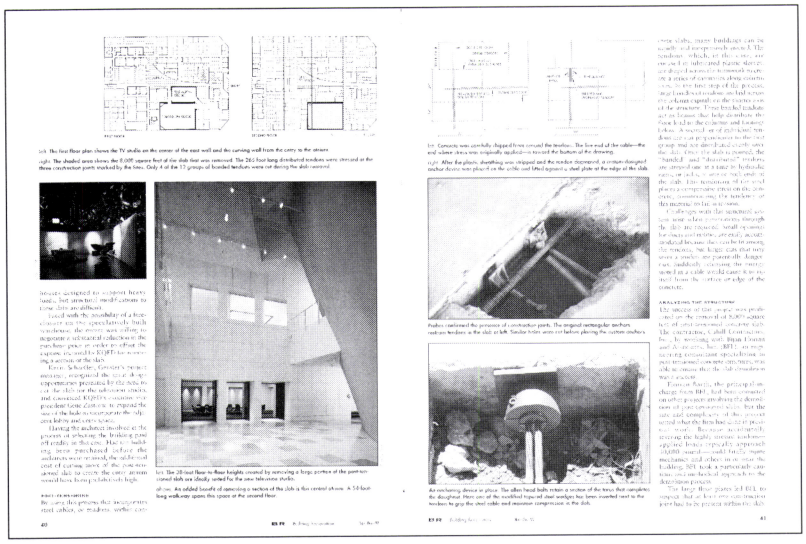

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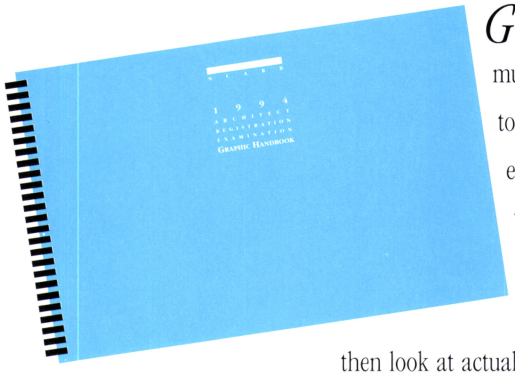

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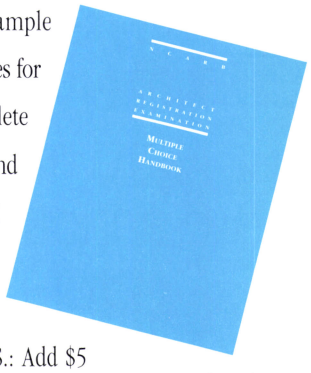

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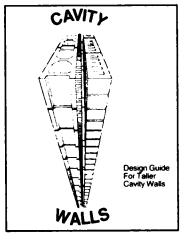

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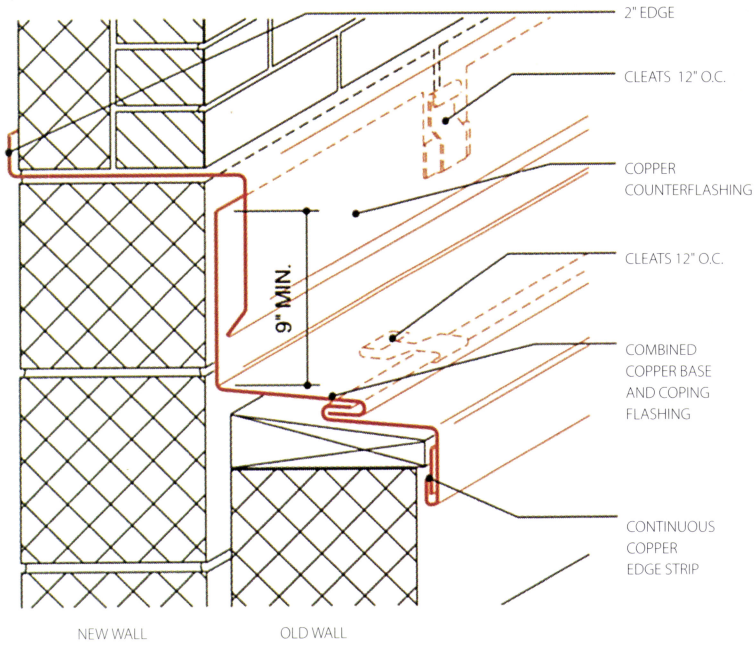

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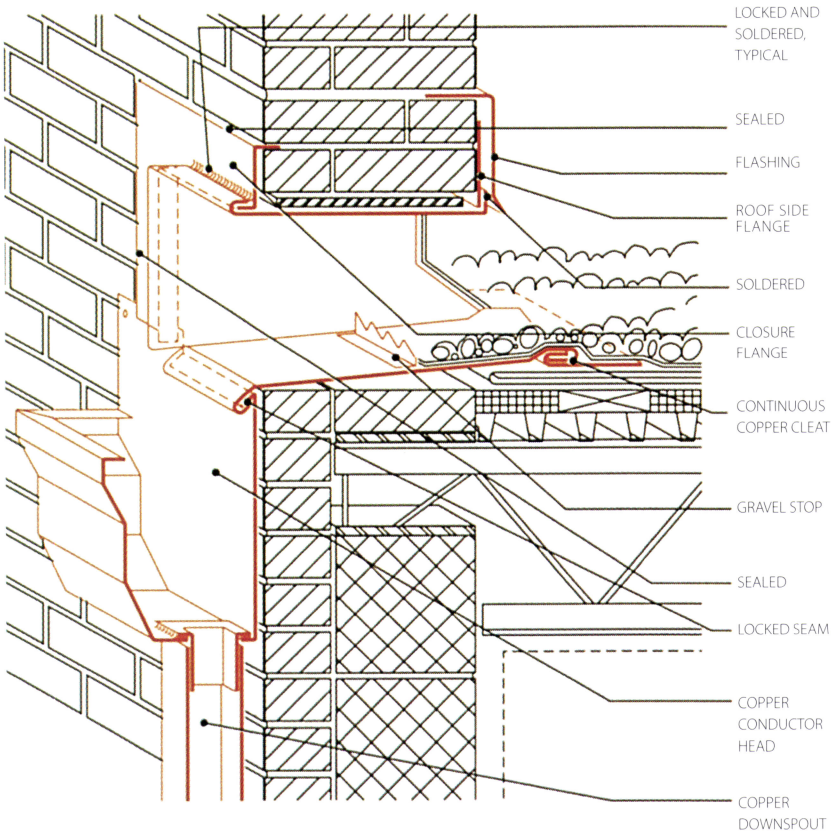

SCUPPER DETAIL

These details demonstrate the use of copper in joining new construction to old, and in securing a leak-free path for water through a roof scupper. Drawings were selected from a new guide, *Copper in Architecture.* For more information on the guide, contact the Copper Development Association at (800) 232-3282.

The first detail shows a condition where a new wall is higher than an older, adjacent wall. A combined coping with a base and counterflashing is used to prevent water from entering between the walls. A continuous copper edge strip is fastened to wood blocking that is anchored to the top of the old wall, and the base flashing locks into this strip and runs over the old wall. Through-wall flashing in the new wall is bent to lap the base flashing and cleats. The bend prevents wind-driven water from moving back up under the counterflashing. The combined base and coping flashing must be sloped to provide positive drainage away from the new wall.

On the scupper detail, masonry fasteners should be used to attach the copper conductor or leader head to the exterior wall. The key to a leak-free scupper is to provide a clear path for water from the roof to the leader, with few if any joints. The lock seam on the scupper's bottom edge should be bent down to aid water flow and to create an edge drip. A continuous sheet of copper counterflashing inserted into a masonry joint above the roof-side flange should extend at least two inches beyond the ends of the flange. Note the inclusion of a gravel stop soldered inside the scupper.

Michael J. Crosbie ■